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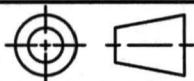
TECHNICAL SPECIFICATION FOR DRAWING 79K39833

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$\pm 1/16$	1 PL $\pm .060$	1 PL $\pm .1$
	2 PL $\pm .030$	
	3 PL $\pm .010$	

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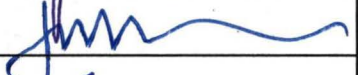

NRRS 2/7.5A
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CAD MAINTAINED. CHANGES SHALL BE INCORPORATED ONLY BY THE DESIGN ACTIVITY.		ORIGINAL DATE OF DRAWING 2014/06/18		JOHN F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA	
SOFTWARE AUTOCAD		APPROVED <i>Joseph Dietz</i> JOSEPH DIETZ		DESIGN OF IOP/SS POST-LIFTOFF BYPASS, LC39B	
FILENAME 79K39834.dwg		<i>Nicholas Riveccio</i> NICHOLAS RIVECCIO			
MATERIAL		<i>Phillip Bennardo</i> PHILLIP BENNARDO		SIZE A	CAGE CODE 22264
HEAT TREATMENT				DWG NO. 79K39834	REV
FINAL PROTECTIVE FINISH				SCALE NOTED	UNIT WEIGHT
				SHEET 1	OF 118

Architect/Engineer of Record Certification

Project Title:	Design of IOP/SS Post-Liftoff Bypass, LC39B
Project Control Number:	98984
Project Drawing Number:	79K39833
Project Specification Number:	79K39834
Project Calculations/Data Manual Number:	KSC-TA-13015

Edit/delete/add disciplines specific to the project.

Discipline	Name	ST	License No.	Signature
Environmental	Ben Chandler	FL	2246	
Structural	James Balmer	FL	54670	
Mechanical	John McMillin	FL	24576	
Division 1 Specification	Joe Dietz	FL	73061	

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SECTION 01 11 00

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1.1 WORK COVERED BY CONTRACT DOCUMENTS

1.1.1 Project Description

1.1.2 Location

1.2 CONTRACT DRAWINGS

PART 2 PRODUCTS

PART 3 EXECUTION

-- End of Section Table of Contents --

SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

1.1.1 Project Description

The work includes the following and incidental related work.

- Partial demolition of existing bypass lines
- Installation of new, large diameter bypass lines
- Installation of small diameter bypass line and high-point drains
- Fabrication and installation of pneumatics panel
- Routing of pneumatics tubing
- Fabrication and erection of access platforms

1.1.2 Location

The work shall be located at the Launch Complex 39B at Kennedy Space Center, Florida.

1.2 CONTRACT DRAWINGS

The following drawings accompany this specification and are a part thereof.

Drawing No. 79K39833
Sheets 1 through 28

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

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SECTION 01 33 00

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1.2 DEFINITIONS

1.2.1 Submittal Descriptions (SD)

1.2.2 Approving Authority

1.2.3 Work

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SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections.

Units of weights and measures used on all submittals are to be the same as those used in the contract drawings.

Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.

Contractor's Quality Control (CQC) System Manager and the Designer of Record, if applicable, to check and approve all items prior to submittal and stamp, sign, and date indicating action taken. Proposed deviations from the contract requirements are to be clearly identified. Include within submittals items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals.

Submittals requiring Government approval are to be scheduled and made prior to the acquisition of the material or equipment covered thereby. Pick up and dispose of samples not incorporated into the work in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

1.2 DEFINITIONS

1.2.1 Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by Submittal Description (SD) numbers and titles as follows:

SD-01 Preconstruction Submittals

Submittals which are required prior to start of construction (work) issuance of contract notice to proceed, or commencing work on site, or the start of the next major phase of the construction on a multi-phase contract, includes schedules, tabular list of data, or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work.

Certificate of Insurance

Surety Bonds

List of proposed Subcontractors

List of proposed products

Construction progress schedule

Network Analysis Schedule (NAS)

Schedule of prices

Health and safety plan

Work plan

Quality Control(QC) plan

Environmental protection plan

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.)

Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports.

Daily logs and checklists.

Final acceptance test and operational test procedure.

SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a manufacturer, supplier, installer or Subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

Confined space entry permits.

Text of posted operating instructions.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and (MSDS) concerning impedances, hazards and safety precautions.

SD-10 Operation and Maintenance Data

Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel, including manufacturer's help and product line documentation necessary to maintain and install equipment. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

This data is intended to be incorporated in an operations and maintenance manual or control system.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

Special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

Interim "DD Form 1354" with cost breakout for all assets 30 days prior to facility turnover.

1.2.2 Approving Authority

Office or designated person authorized to approve submittal.

1.2.3 Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals,

except those SD-01 Pre-Construction Submittals noted above, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

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1.2 ORDERING INFORMATION

PART 2 PRODUCTS

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SOURCES FOR REFERENCE PUBLICATIONS

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization (e.g. ASTM B564 Standard Specification for Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization should be ordered from the source by title rather than by number.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
One East Wacker Drive, Suite 700
Chicago, IL 60601-1802
Ph: 312-670-2400
Fax: 312-670-5403
Publications: 800-644-2400
E-mail: pubs@aisc.org
Internet: <http://www.aisc.org>

AMERICAN PETROLEUM INSTITUTE (API)
1220 L Street, NW
Washington, DC 20005-4070
Ph: 202-682-8000
E-mail: greg.kallio@ihs.com
Internet: <http://www.api.org>

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)
1711 Arlingate Lane
P.O. Box 28518
Columbus, OH 43228-0518
Ph: 800-222-2768; 614-274-6003
Fax: 614-274-6899
E-mail: webmaster@asnt.org
Internet: <http://www.asnt.org>

AMERICAN WELDING SOCIETY (AWS)
8669 NW 36 Street, #130550 N.W. LeJeune Road
Miami, FL 33166-6672

Ph: 800-443-9353 - 305-443-9353
Fax: 305-443-7559
E-mail: info@aws.org or customerservice@awspubs.com
Internet: <http://www.aws.org>

ASME INTERNATIONAL (ASME)
Three Park Avenue, M/S 10E
New York, NY 10016-5990
Ph: 800-854-7179 or 800-843-2763
Fax: 212-591-7674
E-mail: infocentral@asme.org
Internet: <http://www.asme.org>

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959
Ph: 610-832-9585
Fax: 610-832-9555
E-mail: service@astm.org
Internet: <http://www.astm.org>

FLORIDA ADMINISTRATIVE CODE (F.A.C.)
R.A. Gray Building
500 South Bronough Street
Tallahassee, FL 32399-0250
Tel.: (850)245-6270
Fax: (850)488-9879
E-mail: administrativecode@dos.state.fl.us

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National Aeronautics and Space Administration
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NASA - Marshall Space Flight Center
MSFC, Huntsville, AL 35812
Ph: 256-544-2121

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

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Ph: 202-783-3238
Fax: 202-512-1800
E-mail: ContactCenter@gpo.gov
Internet: <http://www.nasa.gov> or <http://www.gpoaccess.gov/help>

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
1 Batterymarch Park
Quincy, MA 02169-7471
Ph: 617-770-3000 or 800-344-3555
Fax: 617-770-0700
E-mail: webmaster@nfpa.org
Internet: <http://www.nfpa.org>

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

40 24th Street, 6th Floor
Pittsburgh, PA 15222-4656
Ph: 412-281-2331
Fax: 412-281-9992
E-mail: info@sspc.org
Internet: <http://www.sspc.org>

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E-mail: pia@hq.afis.asd.mil
Internet: <http://www.dod.gov>
Obtain Military Specifications, Standards and Related Publications
from:
Acquisition Streamlining and Standardization Information System
(ASSIST)
Department of Defense Single Stock Point (DODSSP)
Document Automation and Production Service (DAPS)
Building 4/D
700 Robbins Avenue
Philadelphia, PA 19111-5094
Ph: 215-697-6396 - for account/password issues
Internet: <http://assist.daps.dla.mil/online/start/>; account
registration required
Obtain Unified Facilities Criteria (UFC) from:
Whole Building Design Guide (WBDG)
National Institute of Building Sciences (NIBS)
1090 Vermont Avenue NW, Suite 700
Washington, DC 20005
Ph: 202-289-7800
Fax: 202-289-1092
Internet: http://www.wbdg.org/references/docs_refs.php

U.S. GENERAL SERVICES ADMINISTRATION (GSA)
General Services Administration
1800 F Street, NW
Washington, DC 20405
Ph: 202-501-0800
Internet: www.GSA.gov
Obtain documents from:
Acquisition Streamlining and Standardization Information System
(ASSIST)
Department of Defense Single Stock Point (DODSSP)
Document Automation and Production Service (DAPS)
Building 4/D
700 Robbins Avenue
Philadelphia, PA 19111-5094
Ph: 215-697-6396 - for account/password issues
Internet: <http://assist.daps.dla.mil/online/start/>; account
registration required

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
8601 Adelphi Road
College Park, MD 20740-6001
Ph: 866-272-6272
Fax: 301-837-0483
E-mail: contactcenter@gpo.gov
Internet: <http://www.archives.gov>
Order documents from:
Superintendent of Documents
U.S. Government Printing Office (GPO)
732 North Capitol Street, NW
Washington, DC 20401
Ph: 202-512-1800
Fax: 202-512-2104
E-mail: contactcenter@gpo.gov
Internet: <http://www.gpoaccess.gov>

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

-- End of Section --

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ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

JOHN F. KENNEDY SPACE CENTER (KSC)

KNPR 8500.1	(2010; Rev B) KSC Environmental Requirements
KNPR 8530.1A	(2009; change 3) Affirmative Procurement Program and Plan for Environmentally Preferable Products

FLORIDA ADMINISTRATIVE CODE (FAC)

Chapter 62-701	Solid Waste Management Facilities
Chapter 62-710	Used Oil Management
Chapter 62-730	Hazardous Waste
Chapter 62-737	The Management of Spent Mercury Containing Lamps and Devices Destined for Recycling
Chapter 62-777	Contaminant Cleanup Target Levels
Chapter 62-780	Contamination Site Cleanup Criteria

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

33 CFR 328	Definitions of Waters of the United States
40 CFR 247	Comprehensive Procurement Guideline for Products Containing Recovered Materials
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 273	Standards For Universal Waste Management
40 CFR 279	Standards for the Management of Used Oil
40 CFR 302	Designation, Reportable Quantities, and Notification
40 CFR 355	Emergency Planning and Notification
40 CFR 68	Chemical Accident Prevention Provisions
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions

1.2 DEFINITIONS

1.2.1 Biobased Content

"Biobased content" is calculated as the weight of the biobased material divided by the total weight of the product, and is expressed as a percentage by weight.

1.2.2 Biobased Materials

"Biobased Materials" include fuels, chemicals, building materials, or electric power or heat produced from biomass as defined by the Biomass R&D Act. Minimum biobased content shall be as defined in the U.S. Farm Bill.

1.2.3 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally and/or historically.

1.2.4 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2.5 Contractor Generated Hazardous Waste

Contractor generated hazardous waste means materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene etc.), waste thinners, excess paints, excess solvents, waste solvents, and excess pesticides, and contaminated pesticide equipment rinse water.

1.2.6 Land Application for Discharge Water

The term "Land Application" for discharge water implies that the Contractor must discharge water at a rate which allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" must occur. Land Application must be in compliance with applicable Federal, State, and local laws and regulations.

1.2.7 Life-cycle Cost Analysis

"Life-cycle Cost Analysis" a comparison of the amortized annual cost of using a product with respect to a product that is not Comprehensive Procurement Guideline (CPG) compliant, biobased, environmentally preferable, energy-efficient, water-efficient, recycled-content, and non-ozone depleting or are non-toxic or less toxic. Cost under consideration include capital costs, installation costs, operating costs, maintenance costs, and disposal costs discounted over the lifetime of the product.

1.2.8 Pests

The term "pests" means arthropods, birds, rodents, nematodes, fungi, bacteria, viruses, algae, snails, marine borers, snakes, weeds and other organisms (except for human or animal disease-causing organisms) that adversely affect readiness, military operations, or the well-being of personnel and animals; attack or damage real property, supplies, equipment, or vegetation; or are otherwise undesirable.

1.2.9 Surface Discharge

The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "waters of the United States" and require a permit to discharge water from the governing agency.

1.2.10 Waters of the United States

Waters which are under the jurisdiction of the Clean Water Act, as defined in 33 CFR 328.

1.2.11 Wetlands

Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and bogs. Official determination of whether or not an area is classified as a wetland must be done in accordance with the KSC Environmental Assurance Branch.

1.3 GENERAL REQUIREMENTS

Minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract. Comply with environmental Federal, State, and local laws and regulations. Any

delays resulting from failure to comply with environmental laws and regulations will be the Contractor's responsibility.

1.4 SUBCONTRACTORS

Ensure compliance with this section by subcontractors.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Environmental Protection Plan; G

1.6 ENVIRONMENTAL PROTECTION PLAN

Prior to commencing construction activities or delivery of materials to the site, submit an Environmental Protection Plan for review and approval by the Contracting Officer. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues which the Contractor must address during construction. Issues of concern must be defined within the Environmental Protection Plan as outlined in this section. Address each topic at a level of detail commensurate with the environmental issue and required construction task(s). Topics or issues which are not identified in this section, but are considered necessary, must be identified and discussed after those items formally identified in this section. Prior to submittal of the Environmental Protection Plan, meet with the Contracting Officer for the purpose of discussing the implementation of the initial Environmental Protection Plan; possible subsequent additions and revisions to the plan including any reporting requirements; and methods for administration of the Contractor's Environmental Plans. The Environmental Protection Plan shall be current and maintained onsite by the Contractor.

1.6.1 Compliance

No requirement in this Section will relieve the Contractor of Federal, State, and local environmental protection laws and regulations.

1.6.2 Contents

Include in the Environmental Protection Plan, but not limit it to, the following:

- a. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental Protection Plan.
- b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable.
- c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
- d. Description of the Contractor's environmental protection personnel

training program.

- e. An erosion and sediment control plan which identifies the type and location of the erosion and sediment controls to be provided. The plan shall include monitoring and reporting requirements to assure that the control measures are in compliance with the erosion and sediment control plan, Federal, State, and local laws and regulations. A Storm Water Pollution Prevention Plan (SWPPP) may be substituted for this plan.
- f. Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on the site.
- g. Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plan shall include measures to minimize the amount of mud transported onto paved public roads by vehicles or runoff.
- h. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.
- i. A Spill Control Plan, including the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or local laws and regulations.
 - (1) The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual will immediately notify the Contracting Officer and in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. Include in the plan a list of the required reporting channels and telephone numbers.
 - (2) The name and qualifications of the individual who will be responsible for implementing and supervising the containment and cleanup.
 - (3) Training requirements for Contractor's personnel and methods of accomplishing the training.
 - (4) A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.
 - (5) The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency.
 - (6) The methods and procedures to be used for expeditious contaminant cleanup.

- j. A non-hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris and schedules for disposal.
 - (1) Identify any subcontractors responsible for the transportation and disposal of solid waste. Submit licenses or permits for solid waste disposal sites that are not a commercial operating facility.
 - (2) Evidence of the disposal facility's acceptance of the solid waste must be attached to this plan during the construction. Attach a copy of each of the Non-hazardous Solid Waste Diversion Reports to the disposal plan. Non hazardous solid waste diversion reports shall be submitted using KSC Form 7-648 NS (Rev. 12/08) to the Contracting Officer by December 31 of each year or at the closeout of the project, whichever comes first.
 - (3) Indicate in the report the total amount of waste generated and total amount of waste diverted in cubic yards or tons along with the percent that was diverted.
 - (4) A recycling and solid waste minimization plan with a list of measures to reduce consumption of energy and natural resources. Detail in the plan the Contractor's actions to comply with and to participate in Federal, State, Regional, and local government sponsored recycling programs to reduce the volume of solid waste at the source.
- k. A Waste Management Plan that identifies processes, operations and safety procedures that are site specific for the location and nature of potentially hazardous and controlled waste, which includes but not limited to chemicals, paints, solvents, aerosol cans, petroleum, oil and lubricant (POL) products, lamps, ballasts, mercury switches, etc. and their containers, as defined in 40 CFR 261, 40 CFR 273, 40 CFR 279, or 40 CFR 761.
- l. An air pollution control plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become air borne and travel off the project site.
- m. A Waste Management Plan that identifies processes, operations and safety procedures that are site specific for the location and nature of potentially hazardous and controlled waste, which includes but not limited to chemicals, paints, solvents, aerosol cans, petroleum, oil and lubricant (POL) products, lamps, ballasts, mercury switches, etc. and their containers, as defined in 40 CFR 261, 40 CFR 273, 40 CFR 279, or 40 CFR 761.
- n. A contaminant prevention plan that: identifies potentially hazardous substances to be used on the job site; identifies the intended actions to prevent introduction of such materials into the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of these materials. In support of KNPR 8500.1, Rev. B, KSC Requirements, a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be onsite at any given time must be included in the contaminant prevention plan. Update the plan as new hazardous materials are brought onsite or removed from the site.

- o. A waste water management plan that identifies the methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines. If a settling/retention pond is required, the plan must include the design of the pond including drawings, removal plan, and testing requirements for possible pollutants. If land application will be the method of disposal for the waste water, the plan must include a sketch showing the location for land application along with a description of the pretreatment methods to be implemented. If surface discharge will be the method of disposal, include a copy of the permit and associated documents as an attachment prior to discharging the waste water. If disposal is to a sanitary sewer, the plan must include documentation that the Waste Water Treatment Plant Operator has approved the flow rate, volume, and type of discharge.
- p. A historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on the project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in the area are discovered during construction. Include in the plan methods to assure the protection of known or discovered resources, identifying lines of communication between Contractor personnel and the Contracting Officer.

1.7 PROTECTION FEATURES

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of onsite construction activities, the Contractor and the Contracting Officer will make a joint condition survey. Immediately following the survey, the Contractor shall prepare a brief report including a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s). This survey report will be signed by both the Contractor and the Contracting Officer upon mutual agreement as to its accuracy and completeness. The Contractor must protect those environmental features included in the survey report and indicated on the drawings, regardless of interference which their preservation may cause to the work under the contract.

1.8 ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Deviations from the drawings, plans and specifications, requested by the Contractor and which may have an environmental impact, shall be subject to approval by the Contracting Officer and may require an extended review, processing, and approval time. The Contracting Officer reserves the right to disapprove alternate methods, even if they are more cost effective, if the Contracting Officer determines that the proposed alternate method will have an adverse environmental impact.

1.9 NOTIFICATION

The Contracting Officer will notify the Contractor in writing of observed noncompliance with Federal, State or local environmental laws or regulations, permits and other elements of the Contractor's Environmental Protection Plan. After receipt of such notice, the Contractor shall inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions will be granted or equitable adjustments allowed for such suspensions. This is in addition to other actions the Contracting Officer may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

PART 2 PRODUCTS

2.1 OBJECTIVE

Government procurement policy is to acquire goods and services through the use of sustainable environmental practices, including acquisition of biobased content/material, environmentally preferable, energy-efficient, water-efficient, recycled-content, and non-ozone depleting or are non-toxic or less toxic alternatives where such products and services meet agency performance requirements.

2.2 SUSTAINABLE ACQUISITION

The contractor shall consider products that have a lesser or reduced adverse effect on human health and the environment, and provide products and materials with the least effect on the environment, determined by life-cycle cost analysis or other methods in accordance with KNPR 8530.1A Affirmative Procurement Program and Plan for Environmentally Preferable Products. These comparisons shall consider raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, and disposal of products.

The contractor shall ensure that products and materials being purchased comply, to the greatest extent practicable, with specific requirements regarding environmental attributes. These attributes include:

- a. EPA's CPG and recommendations concerning EPA's list of designated products listed in 40 CFR 247.
- b. Biobased products as defined by the United States Department of Agriculture.
- c. Energy-efficiency requirements regarding Energy Star.

2.2.1 Prohibited Materials

The use of the following materials is prohibited:

- a. Products containing asbestos.
- b. Products containing urea formaldehyde.
- c. Products containing polychlorinated biphenyls.
- d. Products containing chlorinated fluorocarbons.
- e. Solder or flux containing more than 0.2 percent lead and domestic water pipe or pipe fittings containing more than 8 percent lead.
- f. Paint containing more than 0.06 percent lead.

2.2.2 EPA Designated Items Incorporated In the Work

Various sections of the specifications contain requirements for materials that have been designated by EPA in 40 CFR 247 as being products which are or can be made with recovered or recycled materials. These items, when incorporated into the work under this contract, shall contain at least the specified percentage of recycled or recovered materials unless adequate justification (non-availability) for non-use is provided. When a designated item is specified as an option to a non-designated item, the designated item requirements apply only if the designated item is used in the work.

Products listed in 40 CFR 247 have been designated or proposed by EPA to include recycled or recovered materials that may be used by the Contractor in performing the work but will not be incorporated into the work. These products include office products, temporary traffic control products, and pallets. It is recommended that these non-construction products, when used in the conduct of the work, contain the highest practicable percentage of recycled or recovered materials and that these products be recycled when no longer needed.

2.2.3 Waiver

Procurement of EPA-designated (CPG) materials which do not meet the minimum recovered material standards require a waiver, approved by NASA Environmental Assurance Branch. A request for Waiver Form (KSC 28-825 NS) must be submitted for the purchase of items that are on the CPG list but are replaced with items that do not meet minimum standards.

PART 3 EXECUTION

3.1 LAND RESOURCES

Confine activities to areas defined by the drawings and specifications. Identify land resources to be preserved within the work area prior to the beginning of construction. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval, except in areas indicated on the drawings or specified to be cleared. Ropes, cables, or guys will not be fastened or attached to trees for anchorage unless specifically authorized. Provide effective protection for land and vegetation resources at all times, as defined in the following subparagraphs. Remove stone, soil, or other materials displaced into uncleared areas.

3.1.1 Work Area Limits

Mark the areas that need not be disturbed under this contract prior to commencing construction activities. Mark or fence isolated areas within the general work area which are not to be disturbed. Protect monuments and markers before construction operations commence. Where construction operations are to be conducted during darkness, markers shall be visible in the dark. The Contractor's personnel must be knowledgeable of the purpose for marking and/or protecting particular objects.

3.1.2 Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved must be clearly identified by marking, fencing, or wrapping with boards, or other approved

techniques. Restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.

3.1.3 Erosion and Sediment Controls

Providing erosion and sediment control measures in accordance with Federal, State, and local laws and regulations is the Contractor's responsibility. Select and maintain the erosion and sediment controls such that water quality standards are not violated as a result of construction activities. The area of bare soil exposed at any one time by construction operations should be kept to a minimum. Construct or install temporary and permanent erosion and sediment control best management practices (BMPs). BMPs may include, but not be limited to, vegetation cover, stream bank stabilization, slope stabilization, silt fences, construction of terraces, interceptor channels, sediment traps, inlet and outfall protection, diversion channels, and sedimentation basins. The Contractor's best management practices must also be in accordance with the National Pollutant Discharge Elimination System (NPDES) Storm Water Pollution Prevention Plan (SWPPP) which may be reviewed at the NASA Environmental Assurance Branch. Remove temporary measures after the area has been stabilized.

3.1.4 Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only when approved.

3.2 WATER RESOURCES

Monitor water areas affected by construction activities to prevent pollution of surface and ground waters. Do not apply toxic or hazardous chemicals to soil or vegetation unless otherwise indicated.

3.2.1 Wetlands

Do not enter, disturb, destroy, or allow discharge of contaminants into wetlands.

3.3 AIR RESOURCES

Equipment operation, activities, or processes will be in accordance with Federal and State air emission and performance laws and standards.

3.3.1 Particulates

Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials, shall be controlled at all times, including weekends, holidays and hours when work is not in progress. Maintain work areas within or outside the project boundaries free from particulates which would cause the Federal, State, and local air pollution standards to be exceeded or which would cause a hazard or a nuisance. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with State and local visibility regulations.

3.3.2 Burning

Burning is prohibited on Government premises.

3.4 CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Contractor shall develop and maintain procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, or regulated under State or local laws and regulations (e.g. Chapter 62-780) F.A.C. The procedures, instructions, and reports shall supplement the requirements of KNPR 8500.1, Rev. B, KSC Requirements. At a minimum, the Contractor shall:

- (1) Identify the individual who shall report spills, or hazardous substance releases and who shall follow up with complete documentation. This individual shall immediately notify the Contracting Officer and the Environmental Assurance Branch in addition to the legally required Federal, State, and local reporting channels (including the National Response Center at 1-800-424-8802) if a reportable quantity is released to the environment. Provide a list of the required reporting channels and telephone numbers.
- (2) Identify the individual (including qualifications) who shall be responsible for the implementing and supervising spill containment and cleanup.
- (3) Identify training requirements including the name(s) and qualifications of individuals responsible for training Contractor personnel. Include a description of the methods to accomplish the training requirements.
- (4) Identify the materials and equipment to be immediately available at the job site, tailored to contain and cleanup identified spill hazards.
- (5) Identify the names and locations of suppliers of containment materials and locations of additional fuel recovery, cleanup, restoration, and material-placement equipment available in the event of an unforeseen spill emergency.
- (6) Identify methods and procedures to be used for expeditious contaminant containment cleanup. Contractor shall develop and maintain procedures to assure dust, debris, materials, trash, etc. do not become airborne and travel off the project site.

Contractor shall identify potentially hazardous substances to be used on the job site; identify the intended actions to prevent introduction of such materials into the air, water, or ground; and detail provisions for compliance with Federal, State, and local laws and regulations for storage and handling of identified potentially hazardous substances. In support of KNPR 8500.1, Rev. B, KSC Requirements, copies of Material Safety Data Sheets (MSDS) and the maximum quantities of each hazardous material to be onsite must be maintained onsite.

Disposal of wastes shall be as directed below, unless otherwise specified in other sections and/or shown on the drawings.

3.4.1 Solid Wastes

Contractor shall identify methods and locations for solid waste disposal including clearing debris and schedules for disposal. Contractor shall:

- (1) Identify the individual(s), including qualifications, responsible for manifesting hazardous waste to be removed from the site.
- (2) Identify subcontractors responsible for the transportation and disposal of solid waste including licenses and permits.
- (3) Provide evidence of the disposal facility's acceptance of the solid waste including copies of Non-hazardous Solid Waste Diversion Reports upon request. Non-hazardous Solid Waste Diversion Reports shall be submitted using KSC Form 7-648 NS (Rev. 12/08) to the Contracting Officer by December 31 of each year or at the closeout of the project, whichever occurs first.
- (4) Indicate in the Non-hazardous Solid Waste Diversion Report the total amount of waste generated and total amount of waste diverted in cubic yards or tons along with the percent that was diverted.
- (5) Develop a recycling and solid waste minimization plan with a list of measures to reduce the consumption of energy and natural resources. Detail in the plan the Contractor's actions to comply with and to participate in Federal, State, Regional, and local government sponsored recycling programs to reduce the volume of solid waste at the source.

Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. Handling, storage, and disposal shall be conducted to prevent contamination. Employ segregation measures so that no hazardous or toxic waste become co-mingled with solid waste. Contractor shall handle and store wastes in a manor that protects them from the elements (rain, wind.)

Waste items not requiring special handling, or which cannot be resold or recycled, shall be disposed in receptacles slated for disposal in either the KSC landfill or the Brevard County landfill. The physical dimensions of the waste shall be within the handling capabilities of the landfill disposal equipment. The physical dimensions for the landfill handling capabilities are 8 feet in length x 8 feet in width.

The KSC landfill is an unlined Class III landfill with permit restrictions and limited capacity. The landfill is opened Tuesdays and Thursdays between 7:30am to 11:00am and 12:00pm to 3:00pm. Only the following items listed will be accepted at the landfill:

- (1) Asphalt: Asphalt removed from parking lots, driveways and roadways.
- (2) Blast Media: The blast media must be as free from debris as possible and determined non-hazardous for acceptance into the KSC landfill. The Spent Sandblast Media Disposal Form must accompany the blast media to the landfill and will be reviewed by the landfill operator. Blasting media determined to be hazardous waste must be managed as hazardous waste.
- (3) Carpeting: Carpet may be disposed in the KSC landfill.

(4) Construction and Demolition Debris: Materials considered not water soluble and non-hazardous in nature, including but not limited to steel, brick, glass, concrete, asphalt, pipe, gypsum wallboard and lumber. This includes rocks, soils, tree remains and vegetative matter, which normally results from land clearing or development. Scrap metal from demolition projects should be managed according to guidance provided in this section for recyclable material.

(5) Fiberglass: Fiberglass is accepted.

(6) Glass (except for Light Bulbs or Lamps): Glass is accepted.

(7) Non-Friable Asbestos: Also referred to as Non-Regulated Asbestos Containing Materials (NRACM) are handled on a case-by-case basis. KSC policy allows for the disposal of NRACM only. In order to dispose of non-friable asbestos, the Contractor shall complete and submit the KSC/Schwartz Road Landfill Non-Friable Asbestos Form 28-1084 NS (Rev. 10/12), which can be obtained from the Contracting Officer or the Contracting Officer's designee. The form shall be sent to NASA EAB, TA-BIB through the Contracting Officer.

The following scheduling procedures shall be followed before NRACM wastes are accepted at the landfill:

- a. The waste generator/hauler shall make arrangements with the landfill operator a minimum of 24 hours before disposal of NRACM waste and shall inform the operator of the quantity of the waste and the scheduled date the shipment will arrive at the landfill.
- b. NRACM will be accepted at the landfill with prior arrangement with the scale house attendant (minimum of 24 hours notification) Tuesdays or Thursdays during regular landfill hours, but will not be accepted later than 1400 hours.

(8) Pallets (Unserviceable Wood and Plastics): Pallets that are not reusable or recycled are accepted.

(9) Wood: Miscellaneous non-pressure treated wood items are accepted.

(10) Yard Waste (Vegetation): Vegetation from maintenance activities is accepted.

The following wastes are not authorized for disposal at the KSC landfill:

(1) Waste not permitted by DEP regulations to be disposed in a Class III landfill as defined in Rule Chapter 62-701.200(14 F.A.C.).

(2) Putrescible (brown bag) office waste.

(3) Chromated Copper Arsenate (CCA) treated wood.

(4) Liquid or non-liquid polychlorinated biphenyls (PCBs) (with exception of PCB Bulk Product Waste).

(5) Friable Asbestos.

(6) Hazardous wastes as specified by the U.S. Environmental Protection Agency (EPA); EPA defines hazardous waste as those wastes that exhibit flammability, corrosivity, reactivity, and/or toxicity characteristics; (Per EPA's list of hazardous wastes, 40 CFR 261,

Subpart D, and most recent revision thereof).

(7) Biomedical waste.

(8) Liquid wastes, including oil (containerized or non-containerized).

(9) Lead-acid batteries.

(10) Tires, other than "shredded waste tires".

(11) White goods (i.e. appliances).

(12) Unpainted Concrete: Unpainted concrete shall be stockpiled at the Diverted Aggregate Recycling and Collection Yard (DARCY) located at the KSC landfill.

3.4.2 Chemicals and Chemical Wastes

Dispense chemicals ensuring no spillage to the ground or water. Perform and document periodic inspections of dispensing areas to identify leakage and initiate corrective action. This documentation will be periodically reviewed by the Government. Collect chemical waste in corrosion resistant, compatible containers. Collection drums must be monitored and removed to a staging or storage area when contents are within 6 inches of the top. Wastes will be classified, managed, stored, and disposed in accordance with KNPR 8500.1 as well as Federal, State, and local laws and regulations.

3.4.3 Contractor Generated Hazardous Wastes/Excess Hazardous Materials

Hazardous and controlled waste shall be managed in accordance with statutes, rules, orders, and regulations which may include but are not limited to 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 273, 40 CFR 279, 40 CFR 761, and KNPR 8500.1 KSC Environmental Requirements. Inorganic Zinc (IOZ) paint waste shall be separated from other hazardous and controlled wastes and managed in accordance with KNPR 8500.1, Rev. B and the associated KSC Environmental Fact Sheet. In no case shall the Contractor or the Contractor's representative transport hazardous waste from KSC.

The Contractor shall be responsible for identifying processes and operations and the location and nature of potentially hazardous and controlled waste including chemicals, paints, removed paints and coatings, solvents, aerosol cans, petroleum, oil and lubricant (POL) products, lamps, mercury switches, etc. and their containers, as defined in 40 CFR 261, 40 CFR 273, 40 CFR 279, or 40 CFR 761. The Contractor shall prepare copies of Material Safety Data Sheets (MSDS) and a completed KSC Form 25-551 V2 "Process Waste Questionnaire" (PWQ) for each material which may be generated as a waste and provide these to the Contracting Officer thirty (30) days before the start of the waste generation process. No substances shall be delivered to KSC without the appropriate Material Safety Data Sheets.

The Contractor shall obtain a Technical Response Package (TRP) from the Contracting Officer within thirty (30) days after receipt of the PWQ. The TRP will contain a hazard determination and analytical, packaging, labeling, and disposal requirements according to KNPR 8500.1 (as revised) and will provide site-specific waste management requirements to be followed by the Contractor.

The Government will provide DOT-compliant storage containers and labels.

The Contracting Officer will arrange for the containers to be available at the KSC Supply Building, M6-894, at the request of the Contractor. The Contractor shall request storage containers in writing from the Contracting Officer a minimum of three (3) days before the required need date. The Contractor shall be responsible for transporting the containers from Building M6-894 to the project site. The Contractor shall establish an on-site satellite waste accumulation area within 50 feet (ft.) of and within sight of where hazardous or controlled wastes are generated. If a satellite accumulation area must be more than 50 ft. from the point of generation, or out of sight of the generator, the Contractor shall provide a written request to the Contracting Officer thirty (30) days before the start of the waste generating process. The Contracting Officer will send a notification to the NASA Environmental Assurance Branch (EAB), TA-A4B, for their review and concurrence. The Contractor shall not place the satellite site in service before receiving written approval of the variance. The Contractor shall store potential or identified hazardous or controlled wastes in properly labeled containers inside the accumulation area in accordance with KNPR 8500.1, Rev. B (as revised).

The Environmental Protection Agency (EPA) has set the following standards for wastes collected at satellite accumulation areas:

- a. Hazardous wastes at satellite accumulation areas must be collected in approved containers.
- b. No more than 55 gallons per waste stream of hazardous waste or 1 quart per stream of acutely hazardous wastes may be accumulated.
- c. Containers must be labeled with the words "Hazardous Waste" and with other words which identify the contents of the drum.
- d. The waste being placed in the container must be compatible with the container.
- e. A container holding hazardous waste must always be kept closed during accumulation except when adding or removing waste.
- f. The site must be equipped with emergency equipment per 40 CFR 265.32.
- g. A written contingency plan must be maintained for the site.
- h. Personnel generating and managing the waste must have hazardous waste training per 40 CFR 265.16. The Contracting Officer may, during the course of the contract performance period, require the Contractor to provide individual training records for employees involved in the performance of this contract, and the contents of the course or courses completed to satisfy the training requirements. Attendance at KSC Training Course QG-211 "Hazardous Waste Management" will satisfy the above training requirements.

If more than 55 gallons per waste stream of hazardous waste are generated at a satellite accumulation site, documentation, including the waste type, quantity, locations and organization responsible for the waste shall be provided on KSC Form 28-809 "Waste Support Request", and delivered to the Contracting Officer's Environmental Representative.

If a hazardous/non-hazardous waste determination cannot be made by process knowledge and no MSDS is available for the waste stream, the container of waste shall be marked with a Hazardous Waste Determination In Progress

(HWDIP) label until chemical analysis is completed. At the request of the Contractor, the Contracting Officer will provide analytical support required by the TRP. The Contracting Officer will arrange for all sampling and testing of potentially hazardous or controlled waste.

Universal Waste (UW) - The EPA established Universal Waste regulations to ease the requirements for managing hazardous wastes that can be recycled. Items which meet the definition of UW can be collected and managed under requirements found in 40 CFR 273 and Chapter 62-730 and Chapter 62-737, FAC. Waste streams currently adopted by the State for management as UW are batteries, mercury-containing lamps and devices, and certain pesticides.

UW generators are called handlers and must comply with the following requirements:

- a. Handlers shall manage UW using the PWQ/TRP.
- b. Handlers shall manage UW in a way that prevents releases to the environment. Non-leaking containers in good condition shall be used if the UW is damaged or leaking.
- c. Handlers shall use the KSC Universal Waste Label and shall not accumulate universal wastes for more than six months.
- d. Handlers shall clearly show the length of time that the wastes have been accumulated by marking or labeling the container with the earliest date that the waste was generated or received.
- e. Handlers shall be familiar with proper waste handling and emergency response procedures. Attendance at the KSC training course QG-299 "Universal Waste Rule" will satisfy the above.

Used Oil - Any lubricant that has been refined from crude oil (or synthetic oil) that has been "used", and as a result of such use is contaminated by physical or chemical impurities shall be considered Used Oil. Used oil is managed according to regulations established in 40 CFR 279 and Chapter 62-710 F.A.C. The following waste generator standards shall apply to the management of used oil:

- a. Used oil containers, tanks and associated piping must be marked "Used Oil".
- b. Used oil containers, tanks and associated piping must be in good condition with no severe rusting, structural defects, deterioration, or leaks.
- c. Used oil containers must be kept in secondary containment.
- d. Containers storing used oil must be sealed or otherwise protected from the weather and stored on an oil-impermeable surface such as polyethylene sheeting, rigid plastic secondary containment, or epoxy-coated concrete.

Within 48 hours of having waste ready for disposal, the Contractor shall contact the Contracting Officer to have KSC Waste Management pick-up and remove hazardous waste. Documentation including the waste type, quantity, locations, and organization responsible for the waste will be provided on KSC Form 28-809 "Waste Support Request" and delivered to the Contracting Officer's Environmental Representative when requesting waste disposal.

3.4.4 Fuel and Lubricants

Storage, fueling and lubrication of equipment and motor vehicles must be conducted in a manner that affords the maximum protection against spill and evaporation. Manage and store fuel, lubricants and oil in accordance with all Federal, State, Regional, and local laws and regulations. Used lubricants and used oil to be discarded must be stored in marked corrosion-resistant containers and recycled or disposed in accordance with 40 CFR 279, State, and local laws and regulations.

3.4.5 Waste Water

Contractor shall identify methods and procedures for improvement of waste waters which are directly derived from construction activities, such as concrete curing, clean-up, disinfection water, hydrostatic test water and water used in flushing of lines. Dispose of the construction related waste water off-Government property in accordance with Federal, State, Regional and local laws and regulations.

3.5 RECYCLING AND WASTE MINIMIZATION

3.5.1 Reuse

First consideration shall be given to salvage for reuse since little or no re-processing is necessary for this method, and less pollution is created when items are reused in their original form. Sale or donation of waste suitable for reuse shall be considered. Salvaged materials, other than those specified in other sections to be salvaged and reinstalled, shall not be used in this project.

3.5.2 Recycle

Waste materials not suitable for reuse, but having value as being recyclable, shall be made available for recycling whenever economically feasible. For additional information, please contact the NASA/KSC Recycling Manager TA-A4B.

The Contractor shall participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project in accordance with environmental contract clause, Article J-8-21. Concrete that can be recycled shall be sent to the DARC. The DARC can accept unpainted concrete (free of staining) without analytical testing. DARC can also accept painted or coated concrete as long as one of the three conditions below is met:

- Total Metal and PCB laboratory analytical results do not exceed the Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels, Residential, as referenced in Table II of Chapter 62-777 Florida Administrative Code.
- Paint and coating MSDS indicate products do not contain heavy metals or PCBs.
- Total PCB concentration is less than 50 ppm and the paint/coating is completely removed from the concrete.

The contractor shall manage recyclable concrete in accordance with KNPR 8500.1 Rev. B and the DARC Fact Sheet.

3.6 NON-HAZARDOUS SOLID WASTE DIVERSION REPORT

The Contractor shall maintain an inventory of non-hazardous solid waste diversion and disposal of construction and demolition debris. The Contractor shall submit a non-hazardous solid waste diversion report(s) using KSC form 7-648 NS (Rev 12/08) to the Contracting Officer by December 31 of each year or at the close-out of the project, whichever occurs first. Include the following in the report:

Construction and Demolition (C&D) Debris Disposed	_____ cubic yards or tons, as appropriate
Construction and Demolition (C&D) Debris Recycled	_____ cubic yards or tons, as appropriate
Total C&D Debris Generated	_____ cubic yards or tons, as appropriate
Waste Sent to Waste-To-Energy Incineration Plant (This amount should not be included in the recycled amount)	_____ cubic yards or tons, as appropriate

3.7 BIOLOGICAL RESOURCES

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants including their habitat. The protection of threatened and endangered animal and plant species, including their habitat, is the Contractor's responsibility in accordance with Federal, State, Regional, and local laws and regulations.

3.8 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel shall be trained in all phases of environmental protection and pollution control. Conduct environmental protection/pollution control meetings for personnel prior to commencing construction activities. Additional meetings shall be conducted for new personnel and when site conditions change. Include in the training and meeting agenda: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

3.9 MONITORING WELLS

The Contractor shall identify and locate monitoring wells at or adjacent to the project site during the preconstruction survey described in 1.7 of this Section. The Contractor shall protect and prevent the disturbance of these monitoring wells during construction. Disturbance or destruction of a monitoring well during construction shall be replaced at the Contractor's expense. Monitoring wells shall be replaced in accordance with the St. Johns River Water Management District, the Florida Department of Environmental Protection and the Contracting Officer's procedures and requirements.

3.10 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all areas used for construction in accordance with Contract Clause: "Cleaning Up". Unless otherwise instructed in writing by the Contracting Officer, obliterate signs of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed area must be graded, filled and the entire area seeded unless otherwise indicated.

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SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2008; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011; Change 7 2012) Safety and Health Requirements Manual

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 61 National Emission Standards for Hazardous Air Pollutants

1.2 PROJECT DESCRIPTION

1.2.1 Demolition Plan

Prepare a Demolition Plan and submit proposed demolition and removal procedures for approval before work is started. Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Coordinate with Waste Management Plan. Provide procedures for safe conduct of the work in accordance with EM 385-1-1. Plan shall be approved by Contracting Officer prior to work beginning.

1.2.2 General Requirements

Do not begin demolition until authorization is received from the Contracting Officer. In the interest of occupational safety and health, perform the work in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections.

1.3 ITEMS TO REMAIN IN PLACE

Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government. Repair or replace damaged items as approved by the Contracting Officer. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements and pavements to remain. Provide new

supports and reinforcement for existing construction weakened by demolition, or removal work. Repairs, reinforcement, or structural replacement require approval by the Contracting Officer prior to performing such work.

1.3.1 Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide protective measures to control accumulation and migration of dust and dirt in all work areas.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

Demolition Plan; G

1.5 QUALITY ASSURANCE

Submit timely notification of demolition to the Contracting Officer in writing 10 working days prior to the commencement of work in accordance with 40 CFR 61, Subpart M. Comply with Federal, State, and local hauling and disposal regulations.

1.6 PROTECTION

1.6.1 Protection of Personnel

Before, during and after the demolition work continuously evaluate the condition of the area being demolished and take immediate action to protect all personnel working in and around the project site. No area will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

3.1.1 Mechanical Equipment and Fixtures

3.1.1.1 Piping

Disconnect piping at flanges, valves, and fittings as required for demolition. Store salvaged piping according to size and type. Box prefabricated supports, hangers, plates, valves, and specialty items according to size and type. Classify piping not designated for salvage, or not reusable, as scrap metal.

3.1.2 Items With Unique/Regulated Disposal Requirements

Remove and dispose of items in accordance with specification Section
01 57 20.00 10 ENVIRONMENTAL PROTECTION.

3.2 CLEANUP

Remove debris and rubbish from project site. Remove and transport the
debris in a manner that prevents spillage on streets or adjacent areas.
Apply local regulations regarding hauling and disposal.

3.3 DISPOSAL OF REMOVED MATERIALS

3.3.1 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other nonsalvageable materials
resulting from removal operations in accordance with Specification Section
01 57 20.00 10 ENVIRONMENTAL PROTECTION.

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SECTION 05 05 23

WELDING, STRUCTURAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 360 (2010) Specification for Structural Steel Buildings

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ASNT SNT-TC-1A (2011; Text Correction 2013) Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4 (2012) Standard Symbols for Welding, Brazing and Nondestructive Examination

AWS A3.0M/A3.0 (2010) Standard Welding Terms and Definitions

AWS D1.1/D1.1M (2010; Errata 2011) Structural Welding Code - Steel

AWS D1.3/D1.3M (2008; Errata 2008) Structural Welding Code - Sheet Steel

AWS Z49.1 (2012) Safety in Welding and Cutting and Allied Processes

ASTM INTERNATIONAL (ASTM)

ASTM E165/E165M (2012) Standard Practice for Liquid Penetrant Examination for General Industry

ASTM E709 (2008) Standard Guide for Magnetic Particle Examination

1.2 DEFINITIONS

Definitions of welding terms are in accordance with AWS A3.0M/A3.0. The following classifications Class 1 (highest class) to Class 6 (lowest class) indicate the project's class(es) of weld joints.

1.2.1 Class 2 Weld Joints

This covers both complete and partial penetration groove weld joints and fillet weld joints. These weld joints apply where failure would reduce the overall efficiency of a system but loss of the system or a hazard to personnel would not be experienced.

1.3 SYSTEM DESCRIPTION

Conform the design of welded connections to AISC 360, unless otherwise indicated or specified. Material with welds will not be accepted unless the welding is specified or indicated on the drawings or otherwise approved. Perform welding as specified in this section, except where additional requirements are shown on the drawings or are specified in other sections. Do not commence welding until welding procedures, inspectors, nondestructive testing personnel, welders, welding operators, and tackers have been qualified and the submittals approved by the Contracting Officer. Perform all testing at or near the work site. Each Contractor performing welding shall maintain records of the test results obtained in welding procedure, welder, welding operator, and tacker performance qualifications.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

- Welding Procedure Qualifications; G
- Welder, Welding Operator, and Tacker Qualification; G
- Inspector Qualification; G
- Previous Qualifications
- Pre-qualified Procedures; G

SD-06 Test Reports

- Quality Control; G
- Nondestructive Examination; G

SD-07 Certificates

- Certified Welding Procedure Specifications (WPS); G
- Certified Brazing Procedure Specifications (BPS); G
- Certified Procedure Qualification Records (PQR); G
- Certified Welder Performance Qualifications (WPQ); G
- Certified Brazier Performance Qualifications (BPQ); G

1.5 QUALITY ASSURANCE

Except for pre-qualified (in accordance with AWS D1.1/D1.1M) and previously qualified procedures, each Contractor performing welding shall record in detail and qualify the welding procedure specification for any welding procedure followed in the fabrication of weldments. Conform welding procedure qualifications to AWS D1.1/D1.1M and to the

specifications in this section. Submit for approval copies of the welding procedure specification and the results of the procedure qualification test records for each type of welding which requires procedure qualification and the welder, welding operator, or tacker qualification test records.. Approval of any procedure, however, does not relieve the Contractor of the sole responsibility for producing a finished structure meeting all the specified requirements. Submit this information on the forms in Annex M of AWS D1.1/D1.1M. Individually identify and clearly reference on the detail drawings and erection drawings all welding procedure specifications, or suitably key them to the contract drawings. In case of conflict between this specification and AWS D1.1/D1.1M, this specification governs.

1.5.1 General Requirements

To perform this work provide an organization certified in the following: American Institute of Steel Construction (AISC) Quality Certification Program Category I Conventional Steel Structures.

- a. For Structural Projects, provide documentation of the following:
 - (1) Component Thickness 1/8 inch and greater: Qualification documents (WPS, PQR, and WPQ) in accordance with AWS D1.1/D1.1M.
 - (2) Component Thickness Less than 1/8 inch: Qualification documents (WPS, PQR, and WPQ) in accordance with AWS D1.3/D1.3M.
- b. For other applications, provide documentation of the following:
 - (1) Submit for approval to the Contracting Officer two copies of Certified Welding Procedure Specifications (WPS), Certified Brazing Procedure Specifications (BPS) and Certified Procedure Qualification Records (PQR) within fifteen calendar days after receipt of Notice to Proceed.
 - (2) Submit for approval to the Contracting Officer two copies of Certified Welder Performance Qualifications (WPQ) and Certified Brazier Performance Qualifications (BPQ) within fifteen calendar days prior to any employee welding on the project material.

1.5.2 Previous Qualifications

Welding procedures previously qualified by test may be accepted for this contract without re-qualification, upon receipt of the test results, if the following conditions are met:

- a. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.
- b. The qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.
- c. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

1.5.3 Pre-qualified Procedures

Welding procedures which are considered pre-qualified as specified in AWS D1.1/D1.1M will be accepted without further qualification. Submit for approval a listing or an annotated drawing to indicate the joints not pre-qualified. Procedure qualification is mandatory for these joints.

1.5.4 Retests

If welding procedure fails to meet the requirements of AWS D1.1/D1.1M, revise and re-qualify the procedure specification, or at the Contractor's option, welding procedure may be retested in accordance with AWS D1.1/D1.1M. If the welding procedure is qualified through retesting, submit all test results, including those of test welds that failed to meet the requirements, with the welding procedure.

1.5.5 Welder, Welding Operator, and Tacker Qualification

Each welder, welding operator, and tacker assigned to work on this contract shall be qualified in accordance with the applicable requirements of AWS D1.1/D1.1M and as specified in this section. Welders, welding operators, and tackers who make acceptable procedure qualification test welds will be considered qualified for the welding procedure used.

1.5.5.1 Previous Personnel Qualifications

At the discretion of the Contracting Officer, welders, welding operators, and tackers qualified by test within the previous 6 months may be accepted for this contract without re-qualification if all the following conditions are met:

- a. Copies of the welding procedure specifications, the procedure qualification test records, and the welder, welding operator, and tacker qualification test records are submitted and approved in accordance with the specified requirements for detail drawings.
- b. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.
- c. The previously qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.
- d. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

1.5.5.2 Certificates

Before assigning any welder, welding operator, or tacker to work under this contract, submit the names of the welders, welding operators, and tackers to be employed, and certification that each individual is qualified as specified. State in the certification the type of welding and positions for which the welder, welding operator, or tacker is qualified, the code and procedure under which the individual is qualified, the date qualified, and the name of the firm and person certifying the qualification tests. Keep the certification current, on file, and furnish 3 copies.

1.5.5.3 Renewal of Qualification

Re-qualification of a welder or welding operator is required under any of the following conditions:

- a. It has been more than 6 months since the welder or welding operator has used the specific welding process for which he is qualified.
- b. There is specific reason to question the welder or welding operator's ability to make welds that meet the requirements of these specifications.
- c. The welder or welding operator was qualified by an employer other than those firms performing work under this contract, and a qualification test has not been taken within the past 12 months. Submit as evidence of conformance all records showing periods of employment, name of employer where welder, or welding operator, was last employed, and the process for which qualified.
- d. A tacker who passes the qualification test is considered eligible to perform tack welding indefinitely in the positions and with the processes for which he/she is qualified, unless there is some specific reason to question the tacker's ability. In such a case, the tacker is required to pass the prescribed tack welding test.

1.5.6 Inspector Qualification

Inspector qualifications shall be in accordance with AWS D1.1/D1.1M. Qualify all nondestructive testing personnel in accordance with the requirements of ASNT SNT-TC-1A for Levels I or II in the applicable nondestructive testing method. The inspector may be supported by assistant welding inspectors who are not qualified to ASNT SNT-TC-1A, and assistant inspectors may perform specific inspection functions under the supervision of the qualified inspector.

1.5.7 Symbols and Safety

Symbols shall be in accordance with AWS A2.4, unless otherwise indicated. Safe welding practices and safety precautions during welding shall conform to AWS Z49.1.

PART 2 PRODUCTS

2.1 WELDING EQUIPMENT AND MATERIALS

Provide all welding equipment, electrodes, welding wire, and fluxes capable of producing satisfactory welds when used by a qualified welder or welding operator performing qualified welding procedures. All welding equipment and materials shall comply with the applicable requirements of AWS D1.1/D1.1M.

PART 3 EXECUTION

3.1 WELDING OPERATIONS

3.1.1 Requirements

Conform workmanship and techniques for welded construction to the requirements of AWS D1.1/D1.1M and AISC 360. When AWS D1.1/D1.1M and the

AISC 360 specification conflict, the requirements of AWS D1.1/D1.1M govern.

3.1.2 Identification

Identify all welds in one of the following ways:

- a. Submit written records to indicate the location of welds made by each welder, welding operator, or tacker.
- b. Identify all work performed by each welder, welding operator, or tacker with an assigned number, letter, or symbol to identify welds made by that individual. The Contracting Officer may require welders, welding operators, and tackers to apply their symbol next to the weld by means of rubber stamp, felt-tipped marker with waterproof ink, or other methods that do not cause an indentation in the metal. Place the identification mark for seam welds adjacent to the weld at 3 foot intervals. Identification with die stamps or electric etchers is not allowed.

3.2 QUALITY CONTROL

Perform testing using an approved inspection or testing laboratory or technical consultant; or if approved, the Contractor's inspection and testing personnel may be used instead of the commercial inspection or testing laboratory or technical consultant. Perform visual and magnetic particle inspections to determine conformance with paragraph STANDARDS OF ACCEPTANCE. Conform procedures and techniques for inspection with applicable requirements of AWS D1.1/D1.1M, ASTM E165/E165M, ASTM E709. Submit a quality assurance plan and records of tests and inspections.

3.3 STANDARDS OF ACCEPTANCE

Conform dimensional tolerances for welded construction, details of welds, and quality of welds with the applicable requirements of AWS D1.1/D1.1M and the contract drawings. Perform nondestructive testing by visual inspection and magnetic particle methods. The minimum extent of nondestructive testing shall be random 10 percent of welds or joints. All welds shall pass criteria for 100 percent visual inspection per AWS D1.1/D1.1M, Table 6.1.

3.3.1 Nondestructive Examination

The welding is subject to inspection and tests in the mill, shop, and field. Inspection and tests in the mill or shop do not relieve the Contractor of the responsibility to furnish weldments of satisfactory quality. When materials or workmanship do not conform to the specification requirements, the Government reserves the right to reject material or workmanship or both at any time before final acceptance of the structure containing the weldment. Submit all records of nondestructive examination in accordance with paragraph "Acceptance Requirements".

3.3.2 Destructive Tests

Make all repairs when metallographic specimens are removed from any part of a structure. Employ only qualified welders or welding operators, and use the proper joints and welding procedures, including peening or heat treatment if required, to develop the full strength of the members and joints cut and to relieve residual stress.

3.4 GOVERNMENT INSPECTION AND TESTING

In addition to the inspection and tests performed by the Contractor for quality control, the Government will perform inspection and testing for acceptance to the extent determined by the Contracting Officer. The costs of such inspection and testing will be borne by the Contractor if unsatisfactory welds are discovered, or by the Government if the welds are satisfactory. The work may be performed by the Government's own forces or under a separate contract for inspection and testing. The Government reserves the right to perform supplemental nondestructive and destructive tests to determine compliance with paragraph STANDARDS OF ACCEPTANCE.

3.5 CORRECTIONS AND REPAIRS

If inspection or testing indicates defects in the weld joints, repair defective welds using a qualified welder or welding operator as applicable. Conduct corrections in accordance with the requirements of AWS D1.1/D1.1M and the specifications. Repair all defects in accordance with the approved procedures. Repair defects discovered between passes before additional weld material is deposited. Wherever a defect is removed and repair by welding is not required, blend the affected area into the surrounding surface to eliminate sharp notches, crevices, or corners. After a defect is thought to have been removed, and before re-welding, examine the area by suitable methods to ensure that the defect has been eliminated. Repaired welds shall meet the inspection requirements for the original welds. Any indication of a defect is regarded as a defect, unless re-evaluation by nondestructive methods or by surface conditioning shows that no unacceptable defect is present.

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 - 3.7.2.2 Inspection
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 - 3.7.3 Testing for Embrittlement

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SECTION 05 12 00

STRUCTURAL STEEL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 201	(2006) AISC Certification Program for Structural Steel Fabricators
AISC 325	(2011) Steel Construction Manual
AISC 326	(2009) Detailing for Steel Construction
AISC 360	(2010) Specification for Structural Steel Buildings

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2012) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B46.1	(2009) Surface Texture, Surface Roughness, Waviness and Lay
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ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2012) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A143/A143M	(2007) Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A193/A193M	(2012a) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications

ASTM A276	(2013) Standard Specification for Stainless Steel Bars and Shapes
ASTM A325	(2010; E 2013) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A36/A36M	(2012) Standard Specification for Carbon Structural Steel
ASTM A500/A500M	(2010a) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A563	(2007a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A572/A572M	(2012) Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A6/A6M	(2013) Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A992/A992M	(2011) Standard Specification for Structural Steel Shapes
ASTM C1107/C1107M	(2013) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C827/C827M	(2010) Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
ASTM F1554	(2007a; E 2011) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
ASTM F436	(2011) Hardened Steel Washers

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926.756	Steel Erection; Beams and Columns
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1.2 SYSTEM DESCRIPTION

Provide the structural steel system, including galvanizing, complete and ready for use. Structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing shall be provided in accordance with AISC 360 except as modified in this contract.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval.. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication drawings including description of connections; G

SD-03 Product Data

Non-Shrink Grout

SD-06 Test Reports

Bolts, nuts, and washers; G

Supply the certified manufacturer's mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied fasteners.

SD-07 Certificates

Steel

Bolts, nuts, and washers

Galvanizing

AISC Quality Certification

1.4 AISC QUALITY CERTIFICATION

Work shall be fabricated in an AISC certified Category Std fabrication plant.

1.5 QUALITY ASSURANCE

1.5.1 Drawing Requirements

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 326 and AISC 325. Fabrication drawings shall not be reproductions of contract drawings. Sign and seal fabrication drawings by a professional engineer registered in the State of Florida. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Double connections that require an erection seat to comply with OSHA 29 CFR 1926.756(c)(1) shall be shown on the shop drawings, reviewed and approved by the structural engineer of record. Use AWS A2.4 standard welding symbols. Shoring and temporary bracing shall be designed and sealed by a Florida registered professional engineer and submitted for record purposes, with calculations, as part of the drawings. Member substitutions of details shown on the contract drawings shall be clearly highlighted on the fabrication drawings. Explain the reasons for any

deviations from the contract drawings.

1.5.2 Certifications

1.5.2.1 Welding Procedures and Qualifications

See Specification Section 05 05 23 WELDING, STRUCTURAL.

Conform to all requirements specified in AWS D1.1/D1.1M.

PART 2 PRODUCTS

2.1 STEEL

2.1.1 Structural Steel

ASTM A36/A36M.

2.1.2 High-Strength Structural Steel

2.1.2.1 Low-Alloy Steel

ASTM A572/A572M, Grade 50. ASTM A992/A992M Grade 50.

2.1.3 Channels, Angles, and Plates

ASTM A36/A36M.

2.1.4 Structural Steel Tubing

ASTM A500/A500M, Grade B.

2.1.5 Steel Pipe

ASTM A53/A53M, Type E or S, Grade B.

2.2 BOLTS, NUTS, AND WASHERS

Provide the following unless indicated otherwise.

2.2.1 Structural Steel, Steel Pipe and tubing.

2.2.1.1 Bolts

ASTM A325, Type 1. The bolt heads and the nuts of the supplied fasteners must be marked with the manufacturer's identification mark, the strength grade and type specified by ASTM specifications. Hot Dip Galvanized.

2.2.1.2 Nuts

ASTM A563, Grade and Style for applicable ASTM bolt standard recommended. Hot Dip Galvanized.

2.2.1.3 Washers

ASTM F436 washers for ASTM A325 bolts. Hot Dip Galvanized.

2.2.2 Foundation Anchorage

2.2.2.1 Anchor Bolts

ASTM F1554 Gr 36 or 55, Class 1A. Stainless steel ASTM A193/A193M.

2.2.2.2 Anchor Nuts

ASTM A563, Grade A, hex style. Stainless steel ASTM A193/A193M.

2.2.2.3 Anchor Washers

ASTM F436. Stainless steel Type 316 conforming to ASTM A276.

2.2.2.4 Anchor Plate Washers

ASTM A36/A36M Stainless steel Type 316 conforming to ASTM A276.

2.3 STRUCTURAL STEEL ACCESSORIES

2.3.1 Welding Electrodes and Rods

AWS D1.1/D1.1M.

2.3.2 Non-Shrink Grout

ASTM C1107/C1107M, with no ASTM C827/C827M shrinkage. Grout shall be nonmetallic and non-shrink.

2.4 GALVANIZING

ASTM A123/A123M or ASTM A153/A153M, as applicable, unless specified otherwise galvanize after fabrication where practicable, and coat per Section 09 97 13.00 40 STEEL COATINGS..

2.5 FABRICATION

2.5.1 Markings

Prior to erection, members shall be identified by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections shall be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress concentrations. Affix embossed tags to hot-dipped galvanized members.

2.5.2 Shop Primer

2.5.2.1 Cleaning and Primer

See Specification Section 09 97 13.00 40 STEEL COATINGS

PART 3 EXECUTION

3.1 FABRICATION

Fabrication shall be in accordance with the applicable provisions of AISC 325. Fabrication and assembly shall be done in the shop to the greatest extent possible. The fabricating plant shall be certified under

the AISC 201 for Category STD.

Compression joints depending on contact bearing shall have a surface roughness not in excess of 500 micro inch as determined by ASME B46.1, and ends shall be square within the tolerances for milled ends specified in ASTM A6/A6M.

Structural steelwork, except surfaces of steel to be encased in concrete, surfaces to be field welded, and contact surfaces of friction-type high-strength bolted connections shall be prepared for painting in accordance with endorsement "P" of AISC 201 and primed with the specified paint.

Shop splices of members between field splices will be permitted only where indicated on the Contract Drawings. Splices not indicated require the approval of the Contracting Officer.

3.2 ERECTION

- a. Erection of structural steel, shall be in accordance with the applicable provisions of AISC 325. Erection plan shall be reviewed, stamped and sealed by a licensed structural engineer, in the State of Florida.

Provide for drainage in structural steel. After final positioning of steel members, provide full bearing under base plates and bearing plates using nonshrink grout. Place nonshrink grout in accordance with the manufacturer's instructions.

3.2.1 STORAGE

Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

3.3 CONNECTIONS

Except as modified in this section, connections not detailed shall be designed in accordance with AISC 360. Build connections into existing work. Do not tighten anchor bolts set in concrete with impact torque wrenches. Punch, subpunch and ream, or drill bolt holes perpendicular to the surface of the member. Holes shall not be cut or enlarged by burning. Bolts, nuts, and washers shall be clean of dirt and rust, and lubricated immediately prior to installation.

3.3.1 Common Grade Bolts

ASTM F1554 bolts shall be tightened to a "snug tight" fit. "Snug tight" is the tightness that exists when plies in a joint are in firm contact. If firm contact of joint plies cannot be obtained with a few impacts of an impact wrench, or the full effort of a man using a spud wrench, contact the Contracting Officer for further instructions.

3.3.2 High-Strength Bolts

ASTM A325 bolts shall be fully tensioned to 70 percent of their minimum tensile strength. Bolts shall be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, bolts shall then be fully tensioned, progressing from the most rigid part of a connection to the free edges.

3.4 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. Use of a gas cutting torch will be permitted on minor members not under stress only after approval has been obtained from the Contracting Officer.

3.5 WELDING

See Specification Section 05 05 23 WELDING, COATINGS.

3.6 GALVANIZING REPAIR

See Specification Section 09 97 13.00 40 STEEL COATINGS.

3.7 FIELD QUALITY CONTROL

Perform field tests, and provide labor, equipment, and incidentals required for testing, except that electric power for field tests will be furnished as set forth in Division 1. The Contracting Officer shall be notified in writing of defective welds, bolts, nuts, and washers within 7 working days of the date of weld inspection.

3.7.1 Welds

See Specification Section 05 05 23 WELDING, STRUCTURAL.

3.7.2 High-Strength Bolts

3.7.2.1 Testing Bolt, Nut, and Washer Assemblies

Test a minimum of 3 bolt, nut, and washer assemblies from each mill certificate batch in a tension measuring device at the job site prior to the beginning of bolting start-up. Demonstrate that the bolts and nuts, when used together, can develop tension not less than the provisions specified in AISC 360, depending on bolt size and grade. The bolt tension shall be developed by tightening the nut. A representative of the manufacturer or supplier shall be present to ensure that the fasteners are properly used, and to demonstrate that the fastener assemblies supplied satisfy the specified requirements.

3.7.2.2 Inspection

Inspection procedures shall be in accordance with AISC 360. Confirm and report to the Contracting Officer that the materials meet the project specification and that they are properly stored. Confirm that the faying surfaces have been properly prepared before the connections are assembled. Observe the specified job site testing and calibration, and confirm that the procedure to be used provides the required tension. Monitor the work to ensure the testing procedures are routinely followed on joints that are specified to be fully tensioned.

3.7.2.3 Testing

The Government has the option to perform nondestructive tests on 5 percent of the installed bolts to verify compliance with pre-load bolt tension requirements. The Contractor shall allow access for the Government to perform the tests. The nondestructive testing will be done in-place using

an ultrasonic measuring device or any other device capable of determining in-place pre-load bolt tension. The test locations shall be selected by the Contracting Officer. If more than 10 percent of the bolts tested contain defects identified by testing, then all bolts used from the batch from which the tested bolts were taken, shall be tested at the Contractor's expense. Retest new bolts after installation at the Contractor's expense.

3.7.3 Testing for Embrittlement

ASTM A143/A143M for steel products hot-dip galvanized after fabrication.

-- End of Section --

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DIVISION 09 - FINISHES

SECTION 09 97 13.00 40

STEEL COATINGS

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SECTION 09 97 13.00 40

STEEL COATINGS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C920 (2011) Standard Specification for
Elastomeric Joint Sealants

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD 595 (Rev C; 2008) Colors Used in Government
Procurement

JOHN F. KENNEDY SPACE CENTER (KSC)

KSC-STD-SF-0004 (Rev B) Safety Standard for Ground Piping
Systems Color Coding and Identification

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

NASA-STD-5008 (2011b) Protective Coating of Carbon
Steel, Stainless Steel, and Aluminum on
Launch Structures, Facilities, and Ground
Support Equipment

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC AB 1 (2013) Mineral and Slag Abrasives

SSPC Painting Manual (2002) Good Painting Practice, Steel
Structures Painting Manual, Volume 1

SSPC SP 1 (1982; E 2004) Solvent Cleaning

SSPC SP 5 (2007) White Metal Blast Cleaning

SSPC SP 10/NACE No. 2 (2007) Near-White Blast Cleaning

SSPC SP 11 (2012) Power Tool Cleaning to Bare Metal

SSPC SP 3 (1982; E 2004) Power Tool Cleaning

SSPC SP 7 (2007) Brush-Off Blast Cleaning

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-A-22262 (1993; Rev B; Am 2 1996) Abrasive Blasting

Media Ship Hull Blast Cleaning

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals; G

The NACE Certified Coating Inspector shall submit to the Contracting Officer for approval NACE - Certified coating Inspector - Level 3 qualifications and a Coating Inspector Program (CIP) specifically applicable to this project prior to the beginning of an coating work. The program shall include both off-site and on-site work.

The Coating Inspector shall include, as a minimum, the following:

1. Basic Inspection plan for determining compliance with the coating requirements in this section.
2. Inspection Forms which shall identify the key inspection intervals, activities and steps witnessed, inspected, tested and certified for this project.
3. The inspection plan for identifying areas and surfaces damaged during handling, erection and construction activities.
4. Inspection and certifying repairs to damaged areas and surfaces.
5. Submittal schedule for issuing inspection reports. Inspection reports shall be submitted on a weekly basis as a minimum.

Structural assemblies painted offsite and delivered onsite shall require the following:

1. Submittal of the certified daily inspection reports for each item.
2. Spot check a minimum of 10% of surface areas on each item delivered for compliance with the specifications. The government reserves the right to select the areas.
3. 10% of the surface areas shall be divided into 3 separate locations for spot checks.
4. Deficiencies greater than 10% shall require that the assembly be returned to the offsite facility for rework to comply with the specifications.

Material, Equipment, and Fixture Lists shall be submitted in accordance with paragraph entitled, "General," of this section.

A Safety Plan shall be submitted in accordance with paragraph entitled, "General," of this section.

SD-03 Product Data; G

Manufacturer's catalog data shall be submitted for the following items:

Abrasive Blasting Material
Sealant Compound
Inorganic Zinc
Inhibitive Polyamide Epoxy
Aliphatic Polyurethane

Interior Coatings - See Paragraph 3.6

SD-06 Test Reports; G

Inspection reports shall be submitted for protective coating systems in accordance with paragraph entitled, "Inspection," of this section.

SD-07 Certificates; G

Certificates shall be submitted for following items showing conformance with the referenced standards contained in this section.

Abrasive Blasting Material
Sealant Compound
Inorganic Zinc Coating
Inhibitive Polyamide Epoxy
Aliphatic Polyurethane
Interior Coatings - See paragraph 3.6

SD-08 Manufacturer's Instructions; G

Manufacturer's instructions shall be submitted for Protective Coatings including details of thinning, mixing, handling, and application.

Mix Designs

1.3 DELIVERY, HANDLING, AND STORAGE

Materials shall be delivered in their original, unopened containers bearing the manufacturer's name, shelf-life, product identification, and batch number.

Coatings, thinners, and cleaners shall be stored in tightly closed containers in a covered, well-ventilated area where they will be protected from exposure to extreme cold or heat, sparks, flame, direct sunlight, or rainfall. Manufacturer's instructions for storage limitations shall be followed.

1.4 GENERAL

A Safety Plan shall be submitted for protective coating systems in accordance with OSHA regulations.

Material, Equipment, and Fixture Lists shall be submitted for manufacturer's style or catalog numbers, specification and drawing reference numbers and warranty information for the Protective Coatings Systems fabrication site.

Mix Designs shall be submitted for each type of protective coating including a complete list of ingredients and admixtures. Applicable test report shall verify that the mix has been successfully tested and meets design requirements.

PART 2 PRODUCTS

2.1 ABRASIVE BLASTING MATERIAL

Blasting aggregates shall be approved materials in accordance with MIL-A-22262 or SSPC AB 1, Type I or II, Class A, or steel grit. Only materials approved in the QPL attached to MIL-A-22262 shall be used. The abrasive grade selected must produce the required surfaces profile and possess physical properties that are compatible with the requirements of this standard. the steel grit shall be neutral (6.0 to 8.0 pH), rust and oil free, dry, commercial-grade blasting grit with a hardness to 40 to 50 Rockwell C. The size shall be selected to produce the required anchor profile.

2.2 SEALANT COMPOUND

Sealant shall be a self-curing, single component, polysulfide-rubber type conforming to ASTM C920 Type S, Grade NS, Class 25, use NT, A and O. Sealant shall be gray in color and capable of being applied into the joint with a caulking gun.

2.3 PROTECTIVE COATINGS

2.3.1 Coating Systems

This Section establishes the requirements for the application of protective coatings to prevent corrosion of carbon steel surfaces and is adapted from the requirements of NASA-STD-5008. Any deviation found herein shall be brought to the attention of the Contracting Officer and the precedence established by NASA-STD-5008 shall govern.

COATING SYSTEM NO. 1

Coating System No. 1 shall consist of inorganic zinc only, no top coat unless specified. Inorganic zinc shall be selected from the following listing. Coatings, thinners, and cleaners shall be the product of one manufacturer.

Section I. Materials with Greater Than 400 Grams/Liter (3.3 Pounds/Gallon) VOC (SB is Solvent-Based and WB is Water-Based):

Coating Designation	Type	Manufacturer
Dimetcote 9	SB	PPG Industries, Inc. One PPG Place Pittsburgh, PA 15272 (800) 722-4509 http://ppgamercoatus.ppgpmc.com
Carbo-Zinc 11	SB	Carboline Company 2150 Schuetz Road St. Louis, MO 63146 314-644-1000 www.carboline.com

Coating Designation	Type	Manufacturer
Cathacoat 304K Cathacoat 304L	SB SB	International Paint LLC/Devoe Coatings 6001 Antoine Drive Houston, TX
Metalhide 1001	SB	PPG Industries, Inc. One PPG Place Pittsburgh, PA 15272 (800) 722-4509 www.ppg.com
Zinc Clad II	SB	Sherwin-Williams Company 101 Prospect Avenue N.W. Cleveland, OH 44115 (800) 336-1110 www.sherwin-williams.com

Section II. Materials With Less than 400 Grams/Liter (3.3 Pounds/Gallon)
VOC (SB is Solvent Based and WB is Water-Based):

Coating Designation	Type	Manufacturer
Dimetcote D-9HS Dimetcote D-9H	SB SB	PPG Industries, Inc. One PPG Place Pittsburgh, PA 15272 (800) 722-4509 www.ppgamercoatus.ppgpmc.com
Carbo-Zinc 11HS Carbo-Zinc 11WB Carbo-Zinc 11 VOC	SB WB SB	Carboline Company 2150 Schuetz Road St. Louis, MO 63146 314-644-1000 www.carboline.com
Cathacoat 305 Cathacoat 304V	WB SB	International Paint LLC/Devoe Coatings 6001 Antoine Drive Houston, TX
InterZinc 22HS	SB	International Paint LLC 6001 Antoine Drive Houston, TX 77091 (713) 682-1711 (800) 654-2616
Zinc Clad XI Zinc Clad II Plus	WB SB	Sherwin-Williams Company 101 Prospect Avenue N.W. Cleveland, OH 44115 (800) 336-1110 www.sherwin-williams.com

Coating Designation	Type	Manufacturer
Kolor-Zinc 2.8 VOC	SB	Keeler & Long/PPG 856 Echo Lake Road Watertown, CT 06795 1-800-238-8596 http://www.ppg.com/coatings/pmc/brands/keelerlong

COATING SYSTEM NO. 2

Coating System No. 2 shall consist of inorganic zinc first coat, inhibitive polyamide epoxy intermediate coat, and aliphatic polyurethane finish coat. Coatings shall be selected from the following listing and all coatings, thinners, and cleaners shall be the product of the same manufacturer. Each successive coating shall be of a contrasting color to provide a visual assurance of complete coverage.

Section I. Materials with Greater than 400 Grams/Liter (3.3 Pounds/Gallon) VOC (SB is Solvent-Based and WB is Water-Based):

Primer (Type)	Midcoat (Type)	Topcoat (Type)	Manufacturer
Cathacoat 304L(SB) Cathacoat 304L(SB) Cathacoat 304L(SB) Cathacoat 304L(SB) Cathacoat 304K(SB)	Devran 201(SB) * Devran 230(SB) Devran 201(SB) * Devran 201(SB) *	Devthane 359(SB) Devthane 369(SB) Devthane 369(SB) Devthane 379 UVA(SB)	International Paint LLC/Devoe Coatings Co. 6001 Antoine Drive Houston, TX 77091 (713) 682-1711 (800) 654-2616 www.international-pc.com
MetalHide 1001(SB)	PittGuard 95-245(SB)	PittThane 95-812(SB)	PPG Industries, Inc. One PPG Place Pittsburgh, PA 15272 (800) 722-4509 www.ppg.com
Kolor-Zinc 2.8 VOC(SB)	N/A	Coraflon ADS(SB)	Keeler & Long/PPG 856 Echo Lake Road Watertown, CT 06795 1-800-238-8596 http://www.ppg.com/coatings/pmc/brands/keelerlong
Carbozinc 11(SB)	N/A	Carbothane 133 LH(SB)	Carboline Co. 2150 Schuetz Road St. Louis, MO 63146 314-644-1000 www.carboline.com

Primer (Type)	Midcoat (Type)	Topcoat (Type)	Manufacturer
*Can be used as a direct-to-metal primer for stainless steel, aluminum and other materials upon approval by the contracting officer.			

Section II. Materials With Less Than 400 Grams/Liter (3.3 Pounds/Gallon)
VOC (SB is Solvent-Based and WB is Water-Based):

Primer (Type)	Midcoat (Type)	Topcoat (Type)	Manufacturer
D-9HS (SB) D-9HS (SB) D-9H (SB) D-9H (SB) D-9H (SB)	Amerlock400 (SB) * N/A Amercoat383 (SB) Amerlock2/400 (SB) * Amerlock2/400 (SB) *	Amercoat450HS (SB) PSX700 (SB) PSX1001 (SB) Amercoat450H (SB) Amercoat335 (SB)	PPG Industries, Inc. One PPG Place Pittsburgh, PA 15272 (800) 722-4509 http://ppgamercoat.us.ppgpmc.co
CZ-11HS (SB) CZ-11HS (SB) CZ-11HS (SB) CZ-11WB (WB) CZ-11WB (WB) CZ-11WB (WB)	Carboguard893 (SB) * Carbomastic15 (SB) * Carbo893 (SB) * N/A Carboguard893 (SB) * Carboacrylic3358 (WB)	Carbothane134HS (SB) Carboacrylic3359 (WB) Carboxane2000 (SB) Carboxane2000 (SB) Carboacrylic3359 (WB) Carboacrylic3359 (WB)	Carboline Co. 2150 Schuetz Road St. Louis, MO 63146 314-644-1000 www.carboline.com
Cathacoat 304V (SB)	Devran 201H (SB) *	Devthane 379 (SB)	International Paint LLC/Devoe Coatings Co. 6001 Antoine Drive Houston, TX 77091 (713) 682-1711 (800) 654-2616 www.international-pc.com
ZincClad XI (WB) ZincClad II Plus (SB) ZincClad II Plus (SB)	N/A Macropoxy 646-100 (SB) * Macropoxy 646-100 (SB) *	Polysiloxane XLE Hydrogloss WB (WB) Hi-Solids Poly-CA (SB)	Sherwin-Williams Company 101 Prospect Avenue N.W. Cleveland, OH 44115 (800) 336-1110 www.sherwin-williams.com
InterZinc 22HS (SB) InterZinc 22HS (SB)	Interseal 670HS (SB) * Interseal 670HS (SB) *	Interfine 979 (SB) Interfine 878 (SB)	International Paint LLC 6001 Antoine Drive Houston, TX 77091 (713) 682-1711 www.international-pc.com

Primer (Type)	Midcoat (Type)	Topcoat (Type)	Manufacturer
* Can be used as a direct-to-metal primer for stainless steel, aluminum and other materials upon approval by the Contracting Officer.			

COATING SYSTEM NO. 3

Coating System No. 3 shall consist of inorganic zinc first coat and Inorganic Topcoat. Coatings shall be selected from the following listing and all coatings, thinners, and cleaners shall be the product of the same manufacturer. Each successive coating shall be of a contrasting color to provide a visual assurance of complete coverage.

Inorganic Topcoat Systems (SB is Solvent-Based and WB is Water-Based):

Primer (Type)	Midcoat (Type)	Topcoat (Type)	Manufacturer
D-9HS (SB)	N/A	741 (SB) (IOT)	PPG Industries, Inc. One PPG Place Pittsburgh, PA 15272 (800) 722-4509 http://ppgamercoatus.ppgpmc.com/
CZ-11 VOC (SB)	N/A	Carbozinc Finish(SB) (IOT)	Carboline Co. 2150 Schuetz Road St. Louis, MO 63146 314-644-1000 www.carboline.com
CZ-11(SB)	N/A	Carbozinc Finish(SB) (IOT)	
Cathacoat 304V(SB)	N/A	Devram 701(SB) (IOT)	International Paint LLC/Devoe Coatings Co. 6001 Antoine Drive Houston, TX 77091 (713) 682-1711 (800) 654-2616 www.international-pc.com
InterZinc 22HS(SB)	N/A	Intertherm 181(SB) (IOT)	International Paint LLC 6001 Antoine Drive Houston, TX 77091 (713) 682-1711 www.international-pc.com
Zinc Clad II(SB)	N/A	L03(SB) (IOT)	Sherwin-Williams 101 Prospect Ave. Cleveland, OH 44115 (800) 336-1110

COATING SYSTEM NO. 4

See Table for interior pipe coating requirements in paragraph 3.6.

COATING SYSTEM NO. 5

Coating System No. 5 pertains to stainless steel and hot dipped galvanized surfaces coated with an inhibitive polyamide epoxy first coat, and aliphatic polyurethane finish coat. Coatings shall be selected from the following listing and all coatings, thinners, and cleaners shall be the product of the same manufacturer. Each successive coating shall be of a

contrasting color to provide a visual assurance of complete coverage.

Section I. Materials with Greater Than 400 Grams/Liter (3.3 Pounds/Gallon)
VOC (SB is Solvent-Based and WB is Water-Based):

N/A	Carbothane 133 LH(SB)	Carboline Co. 2150 Schuetz Road St. Louis, MO 63146 314-644-1000
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Section II. Materials with Less Than 400 Grams/Liter (3.3 Pounds/Gallon)
VOC (SB is Solvent-Based and WB is Water-Based):

First (Type)	Topcoat (Type)	Manufacturer
Amerlock400 (SB) * N/A Amercoat383 (SB) Amerlock2/400 (SB) * Amerlock2/400 (SB) *	Amercoat450HS (SB) PSX700 (SB) PSX1001 (SB) Amercoat450H (SB) Amercoat335 (SB)	PPG Industries Inc. One PPG Place Pittsburgh, PA 15272 (800) 722-4509 http://ppgamercoat.us.ppgpmc.com
Carboguard893 (SB) * Carbomastic15 (SB) * Carbo893 (SB) * N/A Carboguard893 (SB) * Carboacrylic3358 (WB)	Carbothane134HS (SB) Carboacrylic3359 (WB) Carboxane2000 (SB) Carboxane2000 (SB) Carboacrylic3359 (WB) Carboacrylic3359 (WB)	Carboline Co. 2150 Schuetz Road St. Louis, MO 63146 314-644-1000 www.carboline.com
Devran 201H (SB) *	Devthane 379 (SB)	International Paint LLC/Devoe Coatings Co. 6001 Antoine Drive Houston, TX 77091 (713) 682-1711 (800) 654-2616 www.international-pc.com
N/A Macropoxy 646-100 (SB) * Macropoxy 646-100 (SB) *	Polysiloxane XLE Hydrogloss WB (WB) Hi-Solids Poly-CA (SB)	Sherwin-Williams 101 Prospect Ave. Cleveland, OH 44115 (800) 336-1110 www.sherwin-williams.com
Interseal 670HS (SB) * Interseal 670HS (SB) *	Interfine 979 (SB) Interfine 878 (SB)	International Paint LLC 6001 Antoine Drive Houston, TX 77091 (713) 682-1711 www.international-pc.com
*Can be used as a direct-to-metal primer for stainless steel, aluminum and other materials upon approval by the Contracting Officer		

COATING SYSTEM NO. 6

Coating System No. 6 pertains to conduit, tubing, fittings and related hardware exposed to the corrosive fallout environment of launch facilities. The coating shall be a silicone ablative applied after brush blasting the metal surfaces for good adhesion. The coating products shall be equal to:

GE-3402-NASA

PART 3 EXECUTION

3.1 SURFACE PREPARATION

3.1.1 General

Faying surfaces that will become inaccessible after installation shall be abrasive blasted and coated with inorganic zinc only, prior to installation.

Surfaces to be welded shall be left uncoated. Welded areas shall then be masked and touched up.

Prepared surfaces shall be coated within 6 hours after completion of surface preparation and before rusting or recontamination occurs. Surfaces not coated within 6 hours or which show rusting or contamination, regardless of the length of time after preparation, shall be reprepared.

Surface preparation and coating operations shall be sequenced so that freshly applied coatings will not be contaminated by dust or foreign matter.

Surfaces shall be inspected and degreased as required prior to subsequent surface preparation and the application of protective coatings. Degreasing shall be by solvent cleaning, detergent washing, or steam cleaning. SSPC SP 1 shall apply for solvent cleaning.

3.1.2 Colors

Inorganic zinc coatings shall be pigmented so that there is a definite contrast between the coating and the dull gray appearance of the blasted steel surface during the coating application. Color coding for fluid system piping shall be in accordance with KSC-STD-SF-0004. Finish coat colors specified in paragraph 3.6 shall be in accordance with FED-STD 595 color numbers using pigments free of lead, chromium and cadmium.

3.1.3 Abrasive Blasting (AB)

Abrasive blasting shall conform to SSPC SP 10/NACE No. 2 or SSPC SP 7, as applicable, and SSPC Painting Manual.

Compressed air used for abrasive blasting shall be free of moisture and oil.

Piston rods and bearing surfaces

A minimum nozzle pressure of 90 pounds per square inch shall be maintained for SSPC SP 10/NACE No. 2. Brush blast cleaning pressure shall comply with SSPC SP 7.

Weld slag, weld spatter, and foreign matter shall be removed from surfaces to be coated prior to abrasive blasting using mechanical methods as specified.

Blast cleaning for SSPC SP 10/NACE No. 2 requirements shall achieve a 1-to 2-mil anchor profile as indicated by a surface profile comparator, replica tape, or similar device.

Rust and corrosion shall be removed from pits and depressions.

Abrasive blast aggregate shall not be reused.

All traces of abrasive residue and dust shall be removed from the surface, leaving it clean and dry.

3.1.4 Mechanical Cleaning (MC)

Where mechanical cleaning is specified in the coating schedule, needle scalers or abrasive disks or wheels shall be used in accordance with SSPC SP 3 and SSPC SP 11, leaving the surface cleanliness equivalent to near-white metal (SSPC SP 10/NACE No. 2).

3.2 COATING APPLICATION

3.2.1 General Requirements

Manufacturer's instructions for thinning, mixing, handling, and applying products shall be considered a part of this specification. In the event of conflict between the requirements of this specification and the manufacturer's recommendations, this specification shall take precedence.

Compressed air used for spraying coatings shall be free of moisture and oil.

Each coat of material applied shall be free from runs; sags; blisters; bubbles; mud cracking; variations in color, gloss, and texture; holidays (missed areas); excessive film build; foreign contaminants; and dry overspray.

No coating shall be applied when rain is imminent or when the temperature or humidity is outside the limits recommended by the coating manufacturer.

Surface temperature shall be at least 5 degrees F above the dew point.

Coatings shall be thoroughly worked into all joints, crevices, and open spaces. Special attention shall be paid to welds, cutouts, sharp edges, rivets, crevices, and bolts to ensure proper coverage and thickness.

Newly coated surfaces shall be adequately protected from damage.

Coatings shall be applied by airless or conventional spray. Airless spraying shall be used for uniform large surface areas. Conventional spraying shall be used for small areas of intricate configuration and for touchup. During application of inorganic zinc coating, maintain uniform suspension.

3.2.2 Mixing and Application Procedures

Material shall be stirred thoroughly using an instrument that will not induce air into coating.

Mixed material shall be strained through a 30- to 60-mesh screen.

Continuous slow agitation of the material shall be provided during application of inorganic zinc coating, maintain uniform suspension. Continuous rapid agitation shall be avoided.

Material shall be thinned for workability and improved spray characteristics only.

Material shall be applied in even, parallel passes, overlapping 50 percent. Special attention shall be paid to welds, cutouts, sharp edges, rivets, crevices, and bolts to ensure proper coverage and thickness.

3.2.3 Dry-Film Thickness (DFT)

Coatings shall be applied to the following dry-film thicknesses:

Coating System No. 1:

Inorganic Zinc	4.0 to 6.0 mils
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Coating System No. 2

Inorganic Zinc	2.5 to 4.0 mils
Inhibitive polyamide epoxy	Per mfg instructions
Aliphatic Polyurethane	Per mfg instructions

Coating System No. 3

Inorganic Zinc	4.0 to 6.0 mils
Inorganic Topcoat	3.0 to 5.0 mils

Coating System No. 4

See paragraph 3.6 COATING SCHEDULE - PIPE INTERIOR COATING.

Coating System No. 5

Inhibitive polyamide epoxy	Per mfg instructions
Aliphatic Polyurethane	Per mfg instructions

Coating System No. 6

Silicone Ablative	20 to 30 mils
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3.3 REPAIR AND TOUCH-UP

Repair and touch-up shall be required of all damaged coatings that occur during shipment and field handling. During the construction work, touch-up shall be an on-going process to repair new coatings that are damaged and expose carbon steel surfaces to the elements. Field welds shall be cleaned, painted and inspected promptly to avoid rust formation.

Repair surfaces shall be prepared for coatings by water washing and by

mechanical methods to SSPC SP 11 to a roughness profile of 1.5 mils to remove corrosion and weld slag to bare metal. Repair coatings shall be "feathered in" to adjacent existing coating edges. Coat with inorganic zinc 4 to 6 mils followed by the required topcoat.

The following general touch-up requirements shall apply:

<u>COATING SYSTEM</u>	<u>TOUCH UP COATING</u>
<u>Coating System No. 1:</u>	
Inorganic zinc	Inorganic zinc
<u>Coating System No. 2:</u>	
Inorganic zinc	Inorganic zinc
Inhibitive Polyamide Epoxy	Inhibitive Epoxy
Aliphatic Polyurethane	Aliphatic Polyurethane
<u>Coating System No. 3</u>	
Inorganic zinc	Inorganic zinc
Inorganic topcoat	Inorganic topcoat
<u>Coating System No. 4</u>	
<u>See paragraph 3.6 COATING SCHEDULE - INTERIOR COATING</u>	
<u>Coating System No. 5</u>	
Inhibitive Polyamide Epoxy	Inhibitive Polyamide Epoxy
Aliphatic Polyurethane	Aliphatic Polyurethane
<u>Coating System No. 6</u>	
Silicone Ablative	Silicone Ablative

3.4 SEALANT COMPOUND APPLICATION

For Coating System No. 1 and 3, caulking shall be accomplished after application and cure of inorganic zinc coating.

For Coating System No. 2, caulking shall be accomplished after application and cure of inhibitive epoxy coat and prior to aliphatic polyurethane coat.

Joints shall be caulked, including, but not limited to, the following:

- a. Perimeter of faying and bearing surfaces of structural members
- b. Joints in members between intermittent welds
- c. Perimeter of bearing surfaces between floor plates and supporting members (inside, outside, top, and bottom)
- d. Stair treads, where joined to channel stringers
- e. Openings of 1/2 inch or smaller (Foam filler backup shall be used as required.)
- f. Hot-dipped galvanized vent holes

3.5 INSPECTION

On-site work as described herein shall be inspected for compliance with this specification by an independent NACE (National Association of Corrosion Engineers) Certified Coating Inspector Level 3 provided by the Contractor.

For all protective coatings applied off-site locations, the Contractor shall provide full inspection by an independent NACE Certified Coating Inspector Level 3. Inspector shall be present at the pre-work conference to address necessary clarification of inspection and specification requirements. Apparent deviation from the specified requirements or any out of tolerance condition shall be immediately reported to the Contracting Officer for determination of corrective action. Submit inspection reports weekly performed by the Coating Inspector.

Inspection Reports shall be discussed at the pre-work conference which shall be used by the Coating Inspector and forwarded to the Contracting Officer prior to delivery of the coated work to the job site.

3.6 COATING SCHEDULE

COATING SCHEDULE - PIPE AND STEEL EXTERIOR COATING

<u>SURFACE DESCRIPTION</u>	<u>SURFACE PREPARATION</u>	<u>COATING SYSTEM</u>	<u>FINISH COLOR FOR COATING SYSTEM NO. 2</u>	<u>DRY FILM THICKNESS, PRIMER COAT, MILS</u>
Equipment Supports	SSPC SP 10 or SSPC SP 7 as applicable	3	Gray	IZ or HDG 4.0 to 6.0 mils **IOT 3.0 to 5.0 mils
Carbon Steel Piping Supports	SSPC SP 10 or SSPC SP 7 as applicable	3	Gray	IZ OR HDG 4.0 to 6.0 mils **IOT 3.0 to 5.0 mils
Structural Platforms**	SSPC SP 10	3	Gray	IZ or HDG 4.0 to 6.0 mils **IOT 3.0 to 5.0 mils
Uncoated Carbon Steel Surfaces	SSPC SP 10	3	Gray	IZ 4.0 to 6.0 mils **IOT 3.0 to 5.0 mils
Uncoated Stainless Steel Surfaces	SSPC SP 7	5	Gray	Epoxy & urethane only Per Mfg's Instructions

<u>SURFACE DESCRIPTION</u>	<u>SURFACE PREPARATION</u>	<u>COATING SYSTEM</u>	<u>FINISH COLOR FOR COATING SYSTEM NO. 2</u>	<u>DRY FILM THICKNESS, PRIMER COAT, MILS</u>
Galvanized Surfaces	SSPC SP 7	5	Gray	Epoxy & urethane only Per Mfg's Instructions
Electrical Conduits & Related Hardware	SSPC SP 7	6	White	Silicone Ablative 20 to 30 mils

**Platforms shall include main and secondary framing, ladders, grating, handrails, top plates and column base plates.

Inorganic topcoat (IOT) is required on surfaces exposed to fallout from the launch environment.

NOTE: All new components shall be prepared and coated in accordance with the Coating Schedules within, paragraph 3.6.

COATING SCHEDULE - PIPE INTERIOR COATINGS
INTERIOR COATINGS

Surface Description	Surface Prep Type	Profile Range	First Coat/Stripe Coat/Intermediate/Finish		
			Type	WFT/DFT (per coat)	Color
Interior Steel - Carboline	SSPC SP 5	3.0 to 4.0	Carboguard 891 HS	5-7 mils/ 4-5 mils	Contrasting colors first coat and intermediate coat/white finish coat
Interior Steel - Sherwin Williams	SSPC SP 5	3.0 to 4.0	Tank Clad HS	5-7 mils/ 4-6 mils	Contrasting colors first coat and intermediate coat/white finish coat
Interior Steel - PPG	SSPC SP 5	3.0 to 4.0	Amercoat 333	3-4 mils/ 3-4 mils	Contrasting colors first coat and intermediate coat/white finish coat

-- End of Section --

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DIVISION 40 - PROCESS INTEGRATION

SECTION 40 05 13.96

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SECTION 40 05 13.96

WELDING PROCESS PIPING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ASNT SNT-TC-1A	(2011; Text Correction 2013) Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing
ASNT SNT-TC-1A Q&A Bk A	(2010) Supplement to Recommended Practice No. SNT-TC-1A (Q&A Book): Radiographic Testing Method
ASNT SNT-TC-1A Q&A Bk D	(2011; Text Correction 2011) Supplement to Recommended Practice No. SNT-TC-1A (Q&A Book): Liquid Penetrant Testing Method

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2012) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS A3.0M/A3.0	(2010) Standard Welding Terms and Definitions
AWS B2.1/B2.1M	(2009) Specification for Welding Procedure and Performance Qualification
AWS QC1	(2007) Standard for AWS Certification of Welding Inspectors
AWS Z49.1	(2012) Safety in Welding and Cutting and Allied Processes

ASME INTERNATIONAL (ASME)

ASME B31.3	(2010) Process Piping
ASME BPVC SEC I	(2010) BPVC Section I-Rules for Construction of Power Boilers
ASME BPVC SEC II-C	(2010) BPVC Section II-Materials Part C-Specifications for Welding Rods Electrodes and Filler Metals
ASME BPVC SEC IX	(2010) BPVC Section IX-Welding and Brazing

Qualifications

ASME BPVC SEC V

(2010) BPVC Section V-Nondestructive
Examination

1.2 DEFINITIONS AND SYMBOLS

Definitions shall be in accordance with AWS A3.0M/A3.0. Symbols shall be in accordance with AWS A2.4. These definitions apply to the pre-liftoff and post-liftoff piping systems.

1.3 PERFORMANCE REQUIREMENTS

Quality of all joint preparation, welding, and examination is the Contractor's responsibility. Clearly identify and record all materials used in the welding operations. The inspection and testing defined in this specification are minimum requirements. Additional inspection and testing shall be the responsibility of the Contractor when it is deemed necessary to achieve the quality required.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Welding Procedures; G

SD-02 Shop Drawings

Weld Maps: Detail drawings showing location, length, and type of welds; and indicating postweld heat treatment and NDE as required;
G

SD-03 Product Data

Qualifications; G

Welding procedure qualification.

Welding Operations; G

Detailed procedures which define methods of compliance to contract drawings and specifications. Inspection and material procurement records. System and material testing and certification records. Written records and drawings indicating location of welds made by each welder or welding operator.

SD-06 Test Reports

Weld Inspection Test Reports; G

Note: The government will accept the use of digital radiography in lieu of film provided digital film formats satisfy ASME Section V for clarity in detecting flaw sizes, or have not associated compression algorithm that loses resolution upon file handling.

Two-dimensional (2-D) graphical data shall be delivered in the following lossless image formats:

1. Portable Network Graphics (image/PNG)
2. Tagged Image Format File (image/tiff)
3. Joint Photographic Experts Group 2000 (image/zip)
4. Computer Graphic Metafile (image/cgm)

SD-07 Certificates

Qualifications; G

Welder and welding operator performance qualification certificates. Welding inspectors and NDE personnel certificates. Qualifications of testing laboratory or the Contractor's quality assurance organization.

1.5 QUALIFICATIONS

Welding procedures, welders, and welding operators previously qualified by test may be accepted for the work without requalification, provided that all of the following conditions are fulfilled:

- a. Copies of the welding procedures, the procedure qualification test records, and the welder and welding operator performance qualification test records are submitted and approved in accordance with paragraph SUBMITTALS.
- b. Testing was performed by an approved testing laboratory or technical consultant or by the Contractor's approved quality assurance organization.
- c. The welding procedures, welders, and welding operators were qualified in accordance with ASME BPVC SEC IX, or AWS B2.1/B2.1M, AR-2 level; and base materials, filler materials, electrodes, equipment, and processes conformed to the applicable requirements of this specification.
- d. The requirements of paragraph "Renewal of Qualification" below are met and records showing name of employer and period of employment using the process for which qualified are submitted as evidence of conformance.

1.5.1 Welding Procedures Qualification

Record in detail and qualify the Welding Procedure Specifications for every proposed welding procedure. Qualification for each welding procedure shall conform to the requirements of ASME B31.3, and to this specification. The welding procedures shall specify end preparation for butt welds including cleaning, alignment, and root openings. Preheat, interpass temperature control, and postheat treatment of welds shall be as required by approved welding procedures, unless otherwise indicated or specified. The type of backing rings or consumable inserts, if used, shall be described and if they are to be removed, the removal process shall be described. Copies of the welding procedure specifications and procedure qualification test results for each type of welding required shall be submitted in accordance with paragraph SUBMITTALS. Approval of any procedure does not relieve the Contractor of the sole responsibility for producing acceptable welds. Welding procedures shall be identified

individually and shall be referenced on the detail drawings or keyed to the contract drawings.

1.5.2 Welder and Welding Operator Performance

Each welder and welding operator assigned to work shall be qualified in accordance with ASME B31.3.

1.5.2.1 Certification

Before assigning welders or welding operators to the work, provide the Contracting Officer with their names together with certification that each individual is performance-qualified as specified. The certification shall state the type of welding and positions for which each is qualified, the code and procedure under which each is qualified, date qualified, and the firm and individual certifying the qualification tests.

1.5.2.2 Identification

Identify each particular weld with the personal number, letter, or symbol assigned to each welder or welding operator. To identify welds, written records indicating the location of welds made by each welder or welding operator shall be submitted, and each welder or welding operator shall apply the personal mark adjacent to the welds using a rubber stamp or felt-tipped marker with permanent, weatherproof ink or other methods approved by the Contracting Officer that do not deform the metal. For seam welds, identification marks shall be placed adjacent to the welds at 3 foot intervals. Identification by die stamps or electric etchers will not be allowed.

1.5.2.3 Renewal of Qualification

Requalification of a welder or welding operator is required under any of the following conditions:

- a. When a welder or welding operator has not used the specific welding process for a period of 3 months; the period may be extended to 6 months if the welder or welding operator has been employed on some other welding process.
- b. When a welder or welding operator has not welded with any process during a period of 3 months, all the personal qualifications shall be considered expired, including any extended by virtue of a., above.
- c. There is specific reason to question the person's ability to make welds that will meet the requirements of the specifications.
- d. The welder or welding operator was qualified by an employer, other than those firms performing work under this contract, and a qualification test has not been taken within the preceding 12 months.
- e. Renewal of qualification for a specific welding process under conditions a., b., and d., above, needs to be made on only a single test joint or pipe of any thickness, position, or material to reestablish the welder's or welding operator's qualification for any thickness, position, or material covered under previous qualification.

1.5.3 Inspection and NDE Personnel

All inspection and NDE personnel shall be qualified in accordance with the following requirements.

1.5.3.1 Inspector Certification

Welding inspectors shall be qualified in accordance with AWS QC1.

1.5.3.2 NDE Personnel

NDE personnel shall be certified, and a written procedure for the control and administration of NDE personnel training, examination, and certification shall be established. The procedures shall be based on appropriate specific and general guidelines of training and experience recommended by ASNT SNT-TC-1A, ASNT SNT-TC-1A Q&A Bk A and ASNT SNT-TC-1A Q&A Bk D.

1.6 REGULATORY REQUIREMENTS

This section covers the welding of pressure piping systems. Submit detail drawings showing location, length, and type of welds; and indicating postweld heat treatment and NDE as required. Deviations from applicable codes, approved procedures, and approved detail drawings will not be permitted without prior written approval. Materials or components with welds made offsite will not be accepted if the welding does not conform to the requirements of this specification, unless otherwise specified. Develop procedures for welding all metals included in the work. Welding shall not be started until welding procedures, welders, and welding operators have been qualified. Qualification testing shall be performed by an approved testing laboratory, or by the Contractor if approved by the Contracting Officer. Notify the Contracting Officer at least 24 hours in advance of the time and place of the tests. When practicable, perform the qualification tests at or near the worksite. Maintain current records of the test results obtained in the welding procedure, welding operator, welder performance qualifications, and nondestructive examination (NDE) procedures readily available at the site for examination by the Contracting Officer. The procedures for making transition welds between different materials or between plates or pipes of different wall thicknesses shall be qualified. ASME B31.3. Unless otherwise specified, the choice of welding process shall be the responsibility of the Contractor. Safety precautions shall conform to AWS Z49.1.

1.7 DELIVERY, STORAGE, AND HANDLING

All filler metals, electrodes, fluxes, and other welding materials shall be delivered to the site in manufacturers' original packages and stored in a dry space until used. Packages shall be properly labeled and designed to give maximum protection from moisture and to insure safe handling.

1.7.1 Material Control

Materials shall be stored in a controlled access and clean, dry area that is weathertight and is maintained at a temperature recommended by the manufacturer. The materials shall not be in contact with the floor and shall be stored on wooden pallets or cribbing.

1.7.1.1 Damaged Containers

Low-hydrogen steel electrodes shall be stored in their sealed shipping container. If the seal is damaged during shipment or storage, and the damage is not immediately detected, the covered electrodes in that container shall be rebaked in accordance with the manufacturer's instructions prior to issuance or shall be discarded. If a container is damaged in storage and the damage is witnessed, the electrodes from that container shall be immediately placed in a storage oven. The storage oven temperature shall be as recommended by the manufacturer or the welding material specification.

1.7.1.2 Partial Issues

When a container of covered electrodes is opened and only a portion of the content is issued, the remaining portion shall, within 1/2 hour, be placed in a storage oven.

1.7.2 Damaged Materials

Materials which are damaged shall be discarded. Covered electrodes which are oil or water-soaked, dirty, or on which the flux has separated from the wire shall be discarded.

PART 2 PRODUCTS

2.1 MATERIALS

Provide welding materials which comply with ASME BPVC SEC II-C. Welding equipment, electrodes, welding wire, and fluxes shall be capable of producing satisfactory welds when used by a qualified welder or welding operator using qualified welding procedures.

PART 3 EXECUTION

3.1 WELDING OPERATIONS

Perform welding in accordance with qualified procedures using qualified welders and welding operators. Submit detailed procedures which define methods of compliance to contract drawings and specifications, inspection and material procurement records, system and material testing and certification records and written records and drawings indicating location of welds made by each welder or welding operator.

Welding shall not be done when the quality of the completed weld could be impaired by the prevailing working or weather conditions. The Contracting Officer will determine when weather or working conditions are unsuitable for welding. Welding of hangers, supports, and plates to structural members shall conform to Section 05 05 23 WELDING, STRUCTURAL.

3.1.1 Base Metal Preparation

Oxy-fuel cutting shall not be used on austenitic stainless steel or nonferrous materials.

3.1.2 Weld Joint Fit-Up

Parts that are to be joined by welding shall be fitted, aligned, and retained in position during the welding operation by the use of bars,

jacks, clamps, or other mechanical fixtures. Welded temporary attachments shall not be used except when it is impractical to use mechanical fixtures. When temporary attachments are used, they shall be the same material as the base metal, and shall be completely removed by grinding or thermal cutting after the welding operation is completed. If thermal cutting is used, the attachment shall be cut to not less than 1/4 inch from the member and the balance removed by grinding. After the temporary attachment has been removed, the area shall be visually examined.

3.1.3 Preheat and Interpass Temperatures

Preheat temperatures shall meet the requirements specified by ASME B31.3. However, in no case shall the preheat be below 50 degrees F for ferritic steel. The maximum interpass temperatures shall not exceed 500 degrees F for carbon steels. Preheat techniques shall be such as to ensure that the full thickness of the weld joint preparation and/or adjacent base material, at least 3 inches in all directions, is at the specified temperature. Preheating by induction or resistance methods is preferred. When flame heating is used, only a neutral flame shall be employed. Interpass temperatures shall be checked on the surface of the component within 1 inch of the weld groove and at the starting location of the next weld pass, and for a distance of about 6 inches ahead of the weld, but not on the area to be welded.

3.1.4 Production Welding Instructions

- a. Welding shall not be done when the ambient temperature is lower than 0 degree F.
- b. Welding is not permitted on surfaces that are wet or covered with ice, when snow or rain is falling on the surfaces to be welded, or during periods of high winds, unless the welders and the work are properly protected.
- c. Gases for purging and shielding shall be welding grade and shall have a dew point of minus 40 degrees F or lower.
- e. The purge on groove welds shall be maintained for at least three layers or 3/16 inch.
- f. Removable purge dam materials shall be made of expandable or flexible plugs, such as plexiglass, plywood (which shall be dry when used), etc. Wood dams shall be kiln-dried quality. Nonremovable purge dams and purge dam adhesives shall be made of water soluble materials. Purge dams shall not be made of polyvinyl alcohol.
- g. Any welding process which requires the use of external gas shielding shall not be done in a draft or wind unless the weld area is protected by a shelter. This shelter shall be of material and shape appropriate to reduce wind velocity in the vicinity of the weld to a maximum of 5 mph (440 fpm).
- h. Welding of low-alloy and hardenable high-alloy steels may be interrupted provided a minimum of at least 3/8 inch thickness of weld deposit or 25 percent of the weld groove is filled, whichever is greater, and the preheat temperature is maintained during the time that welding is interrupted. If the temperature falls below the minimum preheat temperature before all welding has been completed on a joint, or, where required, before post weld heat treatment, a liquid

penetrant or magnetic particle examination shall be performed to insure sound deposited metal before reheating. Welding of other materials may be interrupted without restriction provided a visual inspection is performed before welding is resumed.

- i. Tack welds to be incorporated in the final welds shall have their ends tapered by grinding or welding technique. Tack welds that are cracked or defective shall be removed and the groove shall be retacked prior to welding. Temporary tack welds shall be removed, the surface ground smooth, and visually inspected. For low-alloy and hardenable high-alloy steels, the area shall be magnetic particle examination inspected.
- k. When joining ferritic steel pressure piping components to austenitic stainless steel pressure piping components and postweld heat treatment is not required, prepare and weld the joint using either ERNiCr-3 or ENiCrFe-2 filler metals. For service temperatures of 200 degrees F or less, stainless filler metal 309 ASME BPVC SEC II-C, SFA 5.4 or 5.9 is permissible in lieu of the nickel-based alloys.
- l. Grinding of completed welds is to be performed only to the extent required for NDE, including any inservice examination, and to provide weld reinforcement within the requirements of ASME B31.3. If the surface of the weld requires grinding, reducing the weld or base material below the minimum required thickness shall be avoided. Minimum weld external reinforcement shall be flush between external surfaces.

3.1.5 Postweld Heat Treatment

- a. Postweld heat treatment shall be performed in accordance with ASME B31.3. Temperatures for local postweld heat treatment shall be measured continuously by thermocouples in contact with the weldment.
- b. Postweld heat treatment of low-alloy steels, when required, shall be performed immediately upon completion of welding and prior to the temperature of the weld falling below the preheat temperature. However, postweld heat treatment may be postponed after the completion of the weld, if, immediately after the weld is completed, it is maintained at a minimum temperature of 300 degrees F or the preheat temperature, whichever is greater, for 2 hours per inch of weld thickness.
- c. For low-alloy steels, the cooling rates shall be such that temper embrittlement is avoided.

3.2 EXAMINATIONS, INSPECTIONS, AND TESTS

Visual and NDE shall be performed by the Contractor to detect surface and internal discontinuities in completed welds. All weld inspection test reports shall be submitted. The services of a qualified commercial inspection or testing laboratory or technical consultant, approved by the Contracting Officer, shall be employed by the Contractor. All tack welds, weld passes, and completed welds shall be visually inspected. In addition, liquid penetrant examination shall be performed on root passes. When inspection and testing indicates defects in a weld joint, the weld shall be repaired by a qualified welder in accordance with paragraph CORRECTIONS AND REPAIRS.

3.2.1 Random NDE Testing for Carbon Steel Piping

Random radiographic examination is required for carbon steel piping, test a minimum of 10 percent of the total length or number of piping welds. The welds inspected shall be selected randomly, but the selection shall include an examination of welds made by each welding operator or welder. If the random testing reveals that any welds fail to meet minimum quality requirements, an additional 10 percent of the welds in that same group shall be inspected. If all of the additional welds inspected meet the quality requirements, the entire group of welds represented shall be accepted and the defective welds shall be repaired. If any of the additional welds inspected also fail to meet the quality requirements, that entire group of welds shall be rejected. The rejected welds shall be removed and rewelded, or the rejected welds shall be 100 percent inspected and all defective weld areas removed and rewelded.

3.2.2 Visual Inspection

Weld joints shall be inspected visually as follows:

- a. Before welding - for compliance with requirements for joint preparation, placement of backing rings or consumable inserts, alignment and fit-up, and cleanliness.
- b. During welding - for cracks and conformance to the qualified welding procedure.
- c. After welding - for cracks, contour and finish, bead reinforcement, undercutting, overlap, and size of fillet welds.

3.2.3 NDE Testing

NDE shall be in accordance with written procedures. Procedures for radiographic and liquid penetrant tests and methods shall conform to ASME BPVC SEC V. The approved procedure shall be demonstrated to the satisfaction of the Contracting Officer. In addition to the information required in ASME BPVC SEC V, the written procedures shall include the timing of the NDE in relation to the welding operations and safety precautions.

3.2.4 Inspection and Tests by the Government

The Government will perform inspection and supplemental nondestructive or destructive tests as deemed necessary. The cost of supplemental NDE will be borne by the Government. The correction and repair of defects and the reexamination of weld repairs shall be performed by the Contractor at no additional cost to the Government. Inspection and tests will be performed as required for visual inspection and NDE, except that destructive tests may be required also. When destructive tests are ordered by the Contracting Officer and performed by the Contractor, and the specimens or other supplemental examinations indicate that the materials and workmanship do not conform to the contract requirements, the cost of the tests, corrections, and repairs shall be borne by the Contractor. When the specimens or other supplemental examinations of destructive tests indicate that materials or workmanship do conform to the specification requirements, the cost of the tests and repairs will be borne by the Government. When destructive tests are made, repairs shall be made by qualified welders or welding operators using welding procedures which will develop the full strength of the members cut. Welding shall be subject to

inspection and tests in the mill, shop, and field. When materials or workmanship do not conform to the specification requirements, the work may be rejected at any time before final acceptance of the system containing the weldment.

3.3 ACCEPTANCE STANDARDS

3.3.1 Visual

The following indications are unacceptable:

- a. Cracks.
- b. Undercut on surface which is greater than $1/32$ inch deep.
- c. Weld reinforcement greater than $3/16$ inch.
- d. Lack of fusion on surface.
- e. Incomplete penetration (applies only when inside surface is readily accessible).
- f. Convexity of fillet weld surface greater than 10 percent of longest leg plus 0.03 inch.
- g. Concavity in groove welds.
- h. Concavity in fillet welds greater than $1/16$ inch.
- i. Fillet weld size less than indicated or greater than 1.25 times the minimum indicated fillet leg length.

3.3.2 Liquid Penetrant Examination

Indications with major dimensions greater than $1/16$ of an inch shall be considered relevant. The following relevant indications are unacceptable:

- a. Any cracks or linear indications.
- b. Rounded indications with dimensions greater than $3/16$ inch.
- c. Four or more rounded indications in a line separated by $1/16$ inch or less edge-to-edge.
- d. Ten or more rounded indications in any 6 square inches of surface with the major dimension of this area not to exceed 6 inches with the area taken in the most unfavorable location relative to the indications being evaluated.

3.3.3 Radiography

Welds that are shown by radiography to have any of the following discontinuities are unacceptable:

- a. Porosity in excess of that shown as acceptable in ASME BPVC SEC I, Appendix A-250.
- b. Any type of crack or zone of incomplete fusion or penetration.

c. Any other elongated indication which has a length greater than:

(1) $1/4$ inch for "t" up to $3/4$ inch inclusive. Where "t", here and below, pertains to the thickness of the weld being examined; if a weld joins two members having different thickness at the weld, "t" is the thinner of these two thicknesses.

(2) $1/3$ "t" for "t" from $3/4$ inch to $2-1/4$ inch, inclusive.

(3) $3/4$ inch for "t" over $2-1/4$ inch.

d. Any group of indications in line that have an aggregate length greater than "t" in a length of "12t", except where the distance between the successive indications exceeds 6L where L is the longest indication in the group.

3.4 CORRECTIONS AND REPAIRS

Defects shall be removed and repaired as specified in ASME B31.3, unless otherwise specified. Disqualifying defects discovered between weld passes shall be repaired before additional weld material is deposited. Wherever a defect is removed, and repair by welding is not required, the affected area shall be blended into the surrounding surface eliminating sharp notches, crevices, or corners. After defect removal is complete and before rewelding, the area shall be examined by the same test method which first revealed the defect to ensure that the defect has been eliminated. After rewelding, the repaired area shall be reexamined by the same test method originally used for that area. Any indication of a defect shall be regarded as a defect unless reevaluation by NDE or by surface conditioning shows that no disqualifying defects are present. The use of any foreign material to mask, fill in, seal, or disguise welding defects will not be permitted.

-- End of Section --

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-- End of Section Table of Contents --

SECTION 40 05 13

POST-LIFTOFF BYPASS PIPING SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN PETROLEUM INSTITUTE (API)

API Spec 5L (2012) Specification for Line Pipe

ASME INTERNATIONAL (ASME)

ASME B1.20.1 (1983; R 2006) Pipe Threads, General Purpose (Inch)

ASME B16.21 (2011) Nonmetallic Flat Gaskets for Pipe Flanges

ASME B16.3 (2011) Malleable Iron Threaded Fittings, Classes 150 and 300

ASME B16.34 (2013) Valves - Flanged, Threaded and Welding End

ASME B16.47 (2011) Large Diameter Steel Flanges: NPS 26 through NPS 60

ASME B16.5 (2013) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard

ASME B16.9 (2012) Standard for Factory-Made Wrought Steel Buttwelding Fittings

ASTM INTERNATIONAL (ASTM)

ASTM A105/A105M (2012) Standard Specification for Carbon Steel Forgings for Piping Applications

ASTM A193/A193M (2012a) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications

ASTM A194/A194M (2012a) Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both

ASTM A240/A240M (2013a) Standard Specification for

Chromium and Chromium-Nickel Stainless
Steel Plate, Sheet, and Strip for Pressure
Vessels and for General Applications

ASTM A47/A47M	(1999; R 2009) Standard Specification for Ferritic Malleable Iron Castings
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM D3308	(2012) PTFE Resin Skived Tape
ASTM D3892	(1993; R 2009) Packaging/Packing of Plastics
ASTM F402	(2005; R 2012) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 704	(2012) Standard System for the Identification of the Hazards of Materials for Emergency Response
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U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910	Occupational Safety and Health Standards
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1.2 SYSTEM DESCRIPTION

This specification covers the requirements for the fabrication, installation and testing of the post-liftoff bypass piping system, including testing the new 30 inch valves and actuators pre-delivery and on-site.

1.2.1 Design Requirements

All piping shall be adequately supported and anchored as detailed on the drawings.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

48 Inch Valve Protection Plan; G

SD-02 Shop Drawings; G

Layout drawings of the post-liftoff bypass system including 2" vent piping and 6" bypass piping; G

Pneumatic Control Panel; G

SD-03 Product Data

Welders
Threaded Fittings; G
Welding Fittings; G
Flanged Fittings; G
Weldolet Fittings; G
Ball Valves; G
Butterfly Valves; G
Orifice Plates; G
Bolting; G
Gaskets; G
Cable Assembly Connectors; G

SD-06 Test Reports

Valve and Actuator Testing Pre-Delivery; G
Valve and Actuator Testing On-site; G
Cable Assembly Continuity Test; G

SD-07 Certificates

Certification of Materials Compliance; G
Contractor Experience; G

1.4 QUALIFICATIONS

1.4.1 Contractor Experience

Submit a statement certifying that the Contractor has the specified experience. Contractor shall have successfully completed at least 2 projects of the same scope and size or larger within the last 10 years which include the fabrication, installation and testing of large piping systems.

1.4.2 Welders

Submit the names of all qualified welders, their identifying symbols, and the qualifying procedures for each welder including support data such as test procedures used, standards tested to, etc. The welding of pressure piping systems shall be in accordance with qualifying procedures using performance qualified welders and operators. Procedures and welders shall be qualified in accordance with Section 40 05 13.96 WELDING PROCESS PIPING. Structural members shall be welded in accordance with Section 05 05 23 WELDING, STRUCTURAL.

1.4.3 Certificates

The Contractor shall submit a Certification of Materials Compliance.

1.5 DELIVERY, STORAGE, AND HANDLING

Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust and/or other contaminants. Proper protection and care of material before, during and after installation is the Contractor's responsibility. Any material found to be damaged shall be replaced at the Contractor's expense. During installation, piping shall be capped to keep

out dirt and other foreign matter. A material safety data sheet in conformance with 29 CFR 1910 Section 1200(g) shall accompany each chemical delivered for use in pipe installation. At a minimum, this includes all solvents, solvent cements, glues and other materials that may contain hazardous compounds. Handling shall be in accordance with ASTM F402. Storage facilities shall be classified and marked in accordance with NFPA 704. Materials shall be stored with protection from puncture, dirt, grease, moisture, mechanical abrasions, excessive heat, ultraviolet (UV) radiation damage, or other damage. Pipe and fittings shall be handled and stored in accordance with the manufacturer's recommendation. Plastic pipe shall be packed, packaged and marked in accordance with ASTM D3892.

1.6 PROJECT/SITE CONDITIONS

1.6.1 Existing Conditions

The contractor shall verify all dimensions and pipe sizes in the field and advise the Contacting Officer of any discrepancies before performing the work.

PART 2 PRODUCTS

2.1 MATERIALS

2.2 POST-LIFTOFF BYPASS SYSTEM

2.2.1 Carbon Steel Pipe

2.2.1.1 2-inch and 6-inch Diameter Pipe

2-inch and 6-inch diameter pipe shall meet the requirements of ASTM A53/A53M Grade B, Type E (Electric Resistance Welded) Schedule 40.

2.2.1.2 30-inch Diameter Pipe

30-inch diameter pipe shall be shop fabricated to meet the requirements of API Spec 5L-Grade B, standard weight (.375 inch wall thickness).

2.2.2 Carbon Steel Joints

Carbon steel piping shall be joined by welding fittings, flanges and threaded fittings as shown on drawings.

2.2.3 Carbon Steel Fittings

2.2.3.1 Threaded Fittings

Threaded fittings shall be Class 150 malleable iron, ASTM A47/A47M, conforming to ASME B16.3, black, banded and threaded in accordance with ASME B1.20.1. Polytetrafluoroethylene (PTFE) pipe-thread tape conforming to ASTM D3308 shall be used for lubricant/sealant.

2.2.3.2 Welding Fittings

Welding fittings shall be butt-welding. Welding fittings shall be forged steel, ASTM A105/A105M Class 150 conforming to ASME B16.9. Weldolet fittings shall be as shown on the contract drawings.

2.2.3.3 Flanged Fittings

The internal diameter bores of flanges and flanged fittings shall be the same as that of the associated pipe. The flanges shall be welding neck type. Flanges and flanged fittings shall be forged steel, faced and drilled to ASME B16.5 Class 150 with a 0.0625 inch raised face (ASME B16.47 Series A Class 150, for 30" diameter). Bolting shall be ASTM A193/A193M Grade B8 hex head bolts and ASTM A194/A194M Grade 8 hex head nuts. Bolts shall be provided with washers of the same material as the bolts. Gaskets shall meet the requirements of ASME B16.5. Nonmetallic gaskets shall conform to ASME B16.21 and be a maximum 0.125 inch thick chloroprene rubber, durometer hardness No.80, 1,500 psi minimum tensile strength, 125 percent minimum elongation, flat ring type for use with raised face flanges and full face type for use with flat face flanges.

2.2.4 Carbon Steel Coatings

Carbon steel piping components shall be coated in accordance with Section 09 97 13.00 40 STEEL COATINGS.

2.3 VALVES

2.3.1 Ball Valves

Ball valves, 2 inch and smaller, shall be end entry type with bronze bodies and threaded, in accordance with ASME B1.20.1, full bore. Valves shall have polytetrafluoroethylene (PTFE) seats and packing, brass balls and hand lever operators. Valves shall be rated for 400 psig service at 150 degrees F and shall conform to ASME B16.34 Class 150.

2.3.2 Butterfly Valves

30-inch and 6-inch butterfly valves with actuators shall be as shown on the contract drawings.

2.4 PIPE SUPPORTS

Pipe supports shall be as shown on the contract drawings.

2.5 ORIFICE PLATES

Orifice plates shall be ASTM A240/A240M Type 304 Stainless Steel. Contractor shall verify holes sizes prior to installation.

2.6 PNEUMATIC CONTROL PANEL

The pneumatic control panel shall be as shown on the contract drawings.

2.7 CABLE ASSEMBLY CONNECTORS

Cable assembly connectors shall be as shown on the contract drawings.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 PREPARATION

3.2.1 Protection

Pipe and equipment openings shall be closed with caps or plugs during installation. Equipment shall be protected from dirt, water, and chemical or mechanical damage.

The Contractor shall submit a 48 inch valve protection plan that details the methods to protect the valve, actuator, and all components and tubing during all construction activities including the heat and debris caused by cutting and welding operations.

3.2.2 System Preparation

3.2.2.1 Pipe and Fittings

Pipe and fittings shall be inspected before exposed piping is installed. Clean the ends of pipes thoroughly, remove foreign matter and dirt from inside of pipes, and keep piping clean during field work.

3.2.2.2 Damaged Coatings

Repair damaged coating areas in the field with material equal to the original coating. Do not install damaged piping materials. Field repair of damaged and uncoated areas of piping shall conform to Section 09 97 13.00 40 STEEL COATINGS.

3.2.2.3 Field Fabrication

Notify the Contracting Officer at least 2 weeks prior to the field fabrication of pipe or fittings and at least 3 days prior to the start of any surface preparation or coating application work. Field welding shall be performed in accordance with Section 40 05 13.96 WELDING PROCESS PIPING.

3.3 PIPING INSTALLATION

3.3.1 Pipe Flanges

Pipe flanges shall be set level, plumb, and aligned. Flanged fittings shall be installed true and perpendicular to the axis of the pipe. The bolt holes shall be concentric to the centerline of the pipe.

3.4 BUTTERFLY VALVE AND ACTUATOR ASSEMBLY AND TESTING

3.4.1 Valve and Actuator Testing Pre-Delivery

Prior to delivery to the project site, the 30-inch butterfly valves and actuators shall be assembled and tested to verify operation. Opening times shall be recorded. A 3/4-inch diameter 1500 psig GN2 supply line with a 0.070 inch diameter orifice shall be used for testing. The hydraulic system will be filled with the accumulator charged with 30-40 psig GN2 prior to testing. The limit switches will be installed and set during testing to ensure that they indicate when the valves are fully seated (closed) and fully open.

3.4.2 Valve and Actuator Testing On-site

After delivery and installation, all (3) butterfly valve and actuator pairs shall be dry tested using the pneumatic panels No. 2 and 4 with 1500 psig GN2 supply to verify open and close operation. Opening times for all valves shall be recorded using the times from the solenoid valve open signal to the valve actuator open switch signals. In the closed position, the valves shall also be leak checked by filling the elevated tank riser and holding for two hours.

3.5 CABLE ASSEMBLY TESTING

3.5.1 Cable Assembly Continuity Test

After completion of cable assembly fabrication and prior to installation, perform continuity test as herein specified.

Provide all necessary test equipment, labor and personnel to perform the tests, as herein specified.

Perform continuity test to insure correct cable connection end-to-end.

Final acceptance requires the successful performance of cable assembly under test. Do not energize any conductor until the final test reports are reviewed and approved by the Contracting Officer.

3.6 FINAL CLEANING

3.6.1 Cleaning

Prevent the accumulation of weld rod, weld spatter, pipe cuttings and filings, gravel, cleaning rags, and other foreign material within piping sections during fabrication. The piping shall be examined to assure removal of these and other foreign objects prior to assembly and installation.

-- End of Section --

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3.9 PAINTING

3.9.1 Identification

-- End of Section Table of Contents --

SECTION 40 34 10

STAINLESS STEEL TUBING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASME INTERNATIONAL (ASME)

ASME B31.3 (2010) Process Piping

ASTM INTERNATIONAL (ASTM)

ASTM A 167 (2004) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

ASTM A 36/A 36M (2008) Standard Specification for Carbon Structural Steel

ASTM F 402 (2005) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings

JOHN F. KENNEDY SPACE CENTER (KSC)

KSC-C-123 (2009) Surface Cleanliness of Ground Support Equipment Fluid Systems, Specification for

KSC-SPEC-P-0027 Tubing, Superaustenitic Steel, Corrosion Resistant, UNS N08367 and UNS S31254, Seamed, Bright Annealed, Passivated, Specification for

KSC-SPEC-Z-0008 Fabrication and Installation of Flared Tube Assemblies and Installation of Fittings and Fitting Assemblies, Specification for

KSC-STD-Z-0005 (Rev B) Standard for Design of Pneumatic Ground Support Equipment

NASA-SPEC-5004 Welding of Aerospace Ground Support Equipment and Related Nonconventional Facilities

KSC-STD-SF-0004 (Rev B) Safety Standard for Ground Piping Systems Color Coding and Identification

KSC GP-425

(Rev G) Fluid Fitting Engineering Standards

MARSHALL SPACE FLIGHT CENTER (MSFC)

MSFC-SPEC-384

Leak Test Compound, LOX Compatible

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 704

(2012) Standard System for the
Identification of the Hazards of Materials
for Emergency Response

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910

Occupational Safety and Health Standards

1.2 SYSTEM DESCRIPTION

This specification covers the requirements for stainless steel tubing and fittings.

1.2.1 Design Requirements

Support systems shall be selected and designed in accordance with KSC-SPEC-Z-0008 within the specified spans and component requirements. The absence of pipe supports and details on the contract drawings does not relieve the Contractor of responsibility for sizing and providing supports throughout facility.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Qualifications; G

A statement certifying that the Contractor has the specified experience.

Welders; G

The names of all qualified welders, their identifying symbols, and the qualifying procedures for each welder including support data such as test procedures used, standards tested to, etc.

Waste Water Disposal; G

The method proposed is for disposal of waste water from hydrostatic tests and all required permits, prior to performing hydrostatic tests.

Delivery, Storage and Handling; G

Material safety data sheets.

Materials and Equipment; G

List of all tubing and fittings required for complete installation of tubing subsystems shown in contract drawings.

Tubing Schedule; G

A list of tubing systems, pressure ratings and source of supply for each tubing system broken out by material, size and application as indicated on the contract drawings. A list of any special tools necessary for each tubing system and appurtenances furnished for adjustment, operation, maintenance and disassembly of the system.

Tube Welding; G

The Contractor shall submit for approval prior to the start of fabrication the names of all qualified tube welding operators, the qualifying procedures for each operator including support data such as test procedures used, test specimens etc.

Tube Flaring; G

The Contractor shall submit for approval prior to the start of fabrication the names of all qualified tube flaring operators, the qualifying procedures for each operator including support data such as test procedures used, test specimens etc.

Tube Cleanliness; G

The Contractor shall submit for approval prior to the start of fabrication a cleaning procedure to show compliance with KSC-C-123. The Contractor is also responsible for maintaining and preserving the cleanliness of all existing precision cleaned components, GFE and tubing in accordance with the cleanliness level indicated on the drawing. A certification of cleanliness shall be submitted in the final data package.

SD-06 Test Reports; G

Provide for all tests on all systems.

SD-10 Operation and Maintenance Data

Appurtenances; G

Six copies each of operation and maintenance manuals in indexed booklet form. The O&M Manual to include the manufacturer's name, model number, parts list and brief description of system equipment such as valves and other appurtenances and their basic operating features. List in the Maintenance Manuals routine maintenance procedures and troubleshooting guides for the equipment, and include piping layout and valve locations.

1.4 QUALIFICATIONS

1.4.1 Contractor

Contractor shall have successfully completed at least 3 projects of the same scope and size or larger within the last 6 years. Contractor shall demonstrate specific experience in regard to the system installation to be performed.

1.4.2 Welders

The welding of tubing systems shall be in accordance with qualified procedures using performance qualified welders and operators. Procedures and welders shall be qualified in accordance with the requirements of 40 05 13.96 WELDING PROCESS PIPING. Structural members shall be welded in accordance with Section 05 05 23 STRUCTURAL WELDING.

1.5 DELIVERY, STORAGE, AND HANDLING

Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust and/or other contaminants. Proper protection and care of material before, during and after installation is the Contractor's responsibility. Any material found to be damaged shall be replaced at the Contractor's expense. During installation, tubing shall be capped to keep out dirt and other foreign matter. A material safety data sheet in conformance with 29 CFR 1910 Section 1200(g) shall accompany each chemical delivered for use in tube installation. At a minimum, this includes all solvents, solvent cements, glues and other materials that may contain hazardous compounds. Handling shall be in accordance with ASTM F 402. Storage facilities shall be classified and marked in accordance with NFPA 704. Materials shall be stored with protection from puncture, dirt, grease, moisture, mechanical abrasions, excessive heat, ultraviolet (UV) radiation damage, or other damage. Tubing and fittings shall be handled and stored in accordance with the manufacturer's recommendation.

1.6 PROJECT/SITE CONDITIONS

1.6.1 Existing Conditions

The Contractor shall be responsible for the verification of existing piping, tubing and penetrations. Prior to ordering materials, expose all existing pipes which are to be connected to new pipelines. Verify the size, material, joint types, elevation, horizontal location, and pipe service of existing pipes, and inspect size and location of structure penetrations to verify adequacy of wall sleeves, and other openings before installing connecting pipes.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Provide tubing materials and appurtenances as specified and as shown on the drawings, and suitable for the service intended. Tubing materials, appurtenances, and equipment supplied as part of this contract shall be of equal material and ratings as the connecting tube, new and unused except for testing equipment. Components that serve the same function and are the same size shall be identical products of the same manufacturer. The general materials to be used for the tubing systems shall be in accordance

with contract drawings. Tube fittings shall be compatible with the applicable tube materials.

2.1.1 Standard Products

Provide material and equipment which are the standard products of a manufacturer regularly engaged in the manufacturing of the products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Nominal sizes for standardized products shall be used. Tubing, valves, fittings and appurtenances shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

2.2 STAINLESS STEEL TUBING SYSTEM

Stainless steel tubing shall be fabricated and installed per KSC-SPEC-Z-0008. Tube material shall be AL6XN per KSC-SPEC-P-0027. Tubing thickness requirements are shown on the drawings. All tubing shall be GFE.

NOTE: KSC-SPEC-Z-0008 does not address the use of AL6XN tube material. All requirements in KSC-SPEC-Z-0008 shall apply to AL6XN tubing except the following:

The test ball size used for checking the tube inside diameter after bending shall be 0.344" for 1/2"x0.049" wall tube and 0.250" for 3/8"x0.035" wall tube. Note: These tube sizes are not presently used for this project.

Flared fittings shall be per KSC GP-425 and are GFE.

A schedule showing all tubing sizes and thicknesses shall be developed by the Contractor.

2.3 VALVES

Valves shall be as indicated on the drawings.

2.4 TUBE SUPPORTS AND PENETRATIONS

Provide auxiliary steel where the support of tubing systems and equipment is required between building structural elements. Light gauge and structural steel shapes shall conform to the requirements of ASTM A 36/A 36M. The Contractor has the option to use pre-engineered support systems of electrogalvanized steel products. However, a mixture of support system manufacturers products is not permitted. Where auxiliary steel is indicated as stainless steel, provide TP304 stainless steel conforming to ASTM A 167.

2.4.1 Tube Supports

Tube supports shall be provided as shown on the drawings. Where tube supports contact bare tubing or in-line devices, provide supports of compatible material so that neither shall have a deteriorating action on the other.

2.4.1.1 Brackets

Where tubing is run adjacent to structural steel, provide welded

ASTM A 36/A 36M steel brackets, pre-punched with a minimum of two fastener holes.

2.4.1.2 Hangers

Hangers shall be fabricated of ASTM A 36/A 36M carbon steel. All hangers shall be of a uniform type and material for a given tube run and application. Coated or plated hangers shall be used to isolate steel hangers from dissimilar metal tube.

2.4.1.3 Preformed Channel Systems

Preformed channel systems, where permitted, shall be made of 304 stainless steel and all hardware shall be stainless steel and vibration resistant. Spring nuts shall not be used. In lieu of spring nuts, stud nuts shall be used with double nuts to lock nuts in place. Preformed channel system shall be Unistrut or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 PREPARATION

3.2.1 Protection

Tube and equipment openings shall be closed with caps or plugs during installation. Equipment shall be protected from dirt, water, and chemical or mechanical damage.

3.2.2 System Preparation

3.2.2.1 Damaged Coatings

Repair damaged coating areas in the field with material equal to the original coating.

3.2.2.2 Field Fabrication

Notify the Contracting Officer at least 2 weeks prior to the field fabrication of tubing and at least 3 days prior to the start of any surface preparation or coating application work. Tube welding shall be performed in accordance with the requirements of NASA-SPEC-5004 as applicable. Tube weld inspection shall be per KSC-STD-Z-0005 with an additional requirement to perform random radiographic testing of 5 per cent of the welds.

3.3 TUBING INSTALLATION AND TEST REQUIREMENTS

Tubing shall be run as straight as practical along the alignment shown on the contract drawings and with a minimum of joints. Tubing and appurtenances shall be installed in conformance with reviewed shop drawings, manufacturer's instructions and KSC-SPEC-Z-0008. Tubing shall be installed without springing or forcing.

Tube flaring shall be in accordance with KSC-SPEC-Z-0008.

See drawing sheet M-207 for additional tubing installation and test requirements.

3.3.1 Anchors and Fasteners

Impact expansion (hammer and explosive charge drive-type) anchors and fastener systems are not acceptable. Lead shields, plastic or fiber inserts, and drilled-in plastic sleeve/nail drive systems are also not acceptable.

3.3.2 Valve Locations

Valves shall be located in accordance with the drawings.

3.4 TUBING SUPPORT SYSTEMS INSTALLATION

The absence of pipe supports and details on the contract drawings shall not relieve the Contractor of responsibility for providing supports throughout the installation.

3.4.1 General Support Requirements

Tubing support systems shall be provided as shown on the drawings. Tubing connections to equipment shall be supported by supports and not off the equipment. Large or heavy valves, fittings, and/or equipment shall be supported independently of associated tubing. Tubes shall not be supported off other tubes. Supports shall be provided at tubing changes in direction or in elevation, adjacent to flexible joints and couplings, and where otherwise shown on the contract drawings. Tubing supports and hangers shall not be installed in equipment access areas. Hanging tubing shall be braced against horizontal movement by both longitudinal and lateral sway bracing. At each channel type support, every tube shall be provided with an intermediate guide, except where tube anchors are required. Existing support systems may be used to support additional new tubing only if the Contractor can demonstrate that the existing support systems are adequate for the additional loads, or if the existing systems are strengthened to support the additional loads. Pedestal type tube supports shall be provided under base flanges adjacent to rotating equipment and where required to isolate vibration. Lateral supports for seismic loads shall be installed at all changes in direction.

3.4.2 Support Spacing

3.4.2.1 Acceptable Limits for Tubing

See drawings for support spacing requirements. Also, support spacing shall meet the requirements of KSC-SPEC-Z-0008.

3.4.3 Support Methods

Tubing support shall be provided as specified and as shown in the contract drawings. Single horizontal suspended tubing shall be supported by adjustable swivel-ring, split-ring, or clevis hangers. Vertical tubing shall be supported by wall brackets or riser clamps on floor penetrations.

3.4.4 Supports and Hangers for Stainless Steel Tubing

All hanger-pipe contact surfaces shall have a dielectric barrier consisting of chloroprene rubber wrapping or plastic coated hangers.

3.5 TUBING HYDROSTATIC/PNEUMATIC TEST

Tubing shall be pressure tested in accordance with KSC-SPEC-Z-0008, Table 7.

Submit the testing procedure for Government review prior to implementation.

3.6 LEAK TEST

Leak testing shall be performed after completion of the pressure test. The pneumatic leak test shall be performed at the system maximum operating pressure (MOP) using the following:
GN2 for the Gaseous Nitrogen (GN2) System, Gaseous Oxygen (GO2), Breathing Air(BA), and Gaseous Helium (GHe) for the Gaseous Helium (GHe) system.

The surface temperature shall be between 5°C and 51°C (40°F and 125°F) and the MOP shall be maintained for 15 minutes prior to the testing (refer to ASME B31.3 and ASME Boiler and Pressure Vessel Code, Section V, Article 10). All welds and mechanical joints shall be visually bubbletight when tested with MSFC-SPEC-384 leak test solution.

Test records shall be taken, including date of test, identification of tubing system, test gas, and description of test method. The test results shall be certified by a qualified examiner serving as an independent test observer.

Submit the testing procedure for Government review prior to implementation.

3.7 CLEANING

Tube cleanliness shall be verified in accordance with KSC-C-123, flushing media shall be per KSC-C-123.

Required Cleanliness Levels:

Fluid Type Cleanliness Level (per KSC-C-123)

Gaseous Nitrogen (GN2) Visually Clean

Submit the cleaning Procedure to the Government prior to cleaning implementation.

Waste water shall be disposed per Contractors submitted plan.

3.8 DRAIN, DRY AND PURGE

After cleaning the tubing assembly shall be drained and dried using clean GN2. The assembly shall be thoroughly purged until a dewpoint reading of minus 63.5 degree F is reached. A positive GN2 blanket, of at least 5 PSIG shall then be applied to the inner tube and blanked off.

3.9 PAINTING

See specification section 09 97 13.00 40 for Coating Requirements.

3.9.1 Identification

All tubing shall be permanently and legibly marked with identification per KSC-STD-SF-0004.

-- End of Section --

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DIVISION 40 - PROCESS INTEGRATION

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SECTION 40 50 00

PNEUMATICS SYSTEMS (GN2)

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4 (2012) Standard Symbols for Welding,
Brazing and Nondestructive Examination

ASME INTERNATIONAL (ASME)

ASME B16.5 (2013) Pipe Flanges and Flanged Fittings:
NPS 1/2 Through NPS 24 Metric/Inch Standard

ASME B31.3 (2010) Process Piping

ASTM INTERNATIONAL (ASTM)

ASTM A 182/A 182M (2009a) Standard Specification for Forged
or Rolled Alloy-Steel Pipe Flanges, Forged
Fittings, and Valves and Parts for
High-Temperature Service

ASTM A 193 (2008b) Standard Specification for
Alloy-Steel and Stainless Steel Bolting
Materials for High-Temperature Service

ASTM A 194 (2008b) Standard Specification for Carbon
and Alloy Steel Nuts for Bolts for
High-Pressure or High-Temperature Service,
or Both

ASTM A 403/A 403M (2007a) Standard Specification for Wrought
Austenitic Stainless Steel Piping Fittings

JOHN F. KENNEDY SPACE CENTER (KSC)

KSC-STD-SF-0004B (1982) Safety Standard for Ground Piping
Systems Color Coding and Identification

MARSHALL SPACE FLIGHT CENTER (MSFC)

MSFC-SPEC-384 Leak Test Compound, LOX Compatible

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

NASA-SPEC-5004a (2003) Welding of Aerospace Ground Support
Equipment and Related Nonconventional

Facilities

1.2 SCOPE

This section covers requirements for installation of pneumatics panels and equipment and installation in pneumatic systems.

1.3 DESCRIPTION

The Contractor shall provide the labor and materials for the fabrication, installation, supporting, cleaning, testing and identification of the following pneumatic systems:

- a. Gaseous Nitrogen (GN2)

1.4 WORK AREA

The Contractor shall visit the premises to thoroughly familiarize himself with all details of the work and working conditions, verify all dimensions in the field, and indicate verified dimensions on the shop drawings. The Contractor shall be responsible for the coordination and proper relation of his work to the existing structures and to other work.

1.5 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop drawings, fabrication/erection/installation drawings for Control Panel Number 4 shall be submitted for approval in accordance with the Contract Schedule. No work shall begin until the approved shop drawings have been return to the Contractor.

Shop drawings shall include drawings or sketches, descriptive literature, and any other data necessary to completely identify each item specified. Shop drawings shall include detailed fabrication and installation plans of the piping systems including location of fittings, bends, welds, and all other details necessary to fabricate and install the system. All welds shall be indicated in accordance with NASA-SPEC-5004a, AWS A2.4, Drawings M-207 and shall reflect conformance to the referenced specification herein. Proposes deviations from contract specifications and drawings shall be submitted for approval in accordance with the Contract Schedule; G.

SD-03 Product Data

Manufacturer's catalog data shall include catalog cuts, brochures, circulars, specifications, and other product data and printed information in sufficient detail and scope to verify compliance with requirements of the contract documents; G.

SD-06 Test Reports

Except as otherwise specified, an independent testing agency shall prepare reports of inspections and laboratory tests, including analysis and interpretation of test results where applicable.

Each report shall be properly identified and, where required, the testing agency's certification of the test results shall be provided. Test methods used and compliance with recognized test standards shall be described; G.

SD-07 Certificates

As specified in the Contract Schedule and for proposed piping and tubing materials.

No materials shall be installed or delivered to the site until approval has been obtained.

Welders; G

SD-11 Closeout Submittals

Pressure Vessels and Pressurized Systems (PVS) Certification

To facilitate the pressurized system ASME B31.3 certification process the Contractor shall submit a single volume submittal covering the submittal items listed below for the Gaseous Nitrogen Air Systems:

Manufacturer's Catalog Cut Sheets for Components with B31.3 compliance verified and applicable component 79K and 80K drawings; G

Hydrostatic/Pneumatic Test Reports; G

Leak Test Reports; G

Cleaning Reports; G

Note: See the following specification sections for detailed submittal requirements: 40 05 13.96, Welding Process Piping; and 40 34 10, Stainless Steel Tubing.

1.6 PAINTING

Where mechanical equipment is the manufacturer's standard product, it shall be furnished with the manufacturer's standard finish coat, unless otherwise specified. Equipment damaged during construction shall be brought to "as new" condition by touchup, or repainting, to the satisfaction of the Contracting Officer.

Pipe hangers, supports, equipment and other uncoated steel work shall be thoroughly cleaned and painted in accordance with Section 09 97 13.00 98 "STEEL COATINGS".

1.7 EXCEPTIONS

If the proposed equipment and work differ in any manner from that specified in the contract drawings, the Contractor shall submit a request for deviation or waiver for approval in accordance with the Contract Schedule.

1.8 ITEMS OF WORK INCLUDED

Items of work to be provided by the Contractor include, but are not limited to, the following:

Install panels with supplementary steel and fasteners for panel mounting.

Install piping and tubing; flanges and bolts; fittings; pipe hangers; pipe supports; pipe anchors; support saddles; sway braces and all connections

Install all supplemental structural steel indicated for pipe hangers, pipe supports, pipe anchors, support saddles and anchors for the proper installation and erection of the piping systems

All materials and labor for welding and cutting operations

Cleaning of mill scale, sand, rust and other undesirable matter from the interior piping prior to erection

Pressure and leak testing of all piping systems installed by the Contractor

Cutting of holes in grating, plate, walls, structures, etc., in only those cases where required for the passage of only that piping shown on the drawings and only then with prior approval of Contracting Officer

Final adjustment of all hangers and supports

1.9 INTERFERENCES

The Contractor shall coordinate the work of the different trades so that interference between piping, equipment, structural, and electrical work will be avoided. All necessary offsets in piping and all fittings, etc., required to properly install the work shall be furnished complete in place without additional cost to the Government. If interference develops, the Contracting Officer will decide which equipment shall be relocated, regardless of which apparatus was installed first.

1.10 MAINTAINING CLEANLINESS LEVELS

Where equipment or components have been chemically cleaned, the Contractor shall take necessary precautions to maintain the cleanliness levels. If these cleanliness levels are degraded, the Contractor shall be responsible for recleaning at no cost to the Government.

1.11 CUTTING

Cutting of construction or work done by others shall be done only with the written permission of the Contracting Officer. Any damage to the structure, piping, wiring or equipment as a result of cutting for installation shall be repaired by skilled mechanics of the trade involved, at no additional expense to the Government.

1.12 DISSIMILAR METALS

Where dissimilar metals are assembled together, a material compatible with each material shall be interposed between them.

1.13 GOVERNMENT-FURNISHED EQUIPMENT (GFE)

AL6XN and KC fittings shall be GFE and will be furnished by the Government

at a storage area located on Kennedy Space Center. The Contractor shall accept delivery and load, transport, and unload at his own expense. The Contractor shall perform all operations necessary for installing or incorporating the GFE in the work.

1.14 QUALIFICATIONS

1.14.1 Contractor

Contractor shall have successfully completed at least 3 projects of the same scope and size or larger within the last 6 years. Contractor shall demonstrate specific experience in regard to the system installation to be performed.

1.14.2 Welders

The welding of piping and tubing systems shall be in accordance with qualified procedures using performance qualified welders and operators. Procedures and welders shall be qualified in accordance with the requirements of 40 05 13.96 WELDING PROCESS PIPING. Structural members shall be welded in accordance with Section 05 05 23 STRUCTURAL WELDING.

PART 2 PRODUCTS

All materials shall be new and compatible with the specified fluid or gas media. Pipe sizes shall be indicated on the drawing.

2.1 TUBING

Type AL6XN in accordance with Section 40 34 10, "STAINLESS STEEL TUBING".

2.2 FITTINGS

Welded, Weldneck, 300 psig, ASTM A 182/A 182M Grade F 304 and flanges ASME B16.5 (to match pipe wall thickness)

Welded, ASTM A 403/A 403M, Grade WP304 or WP316 fittings, (to match pipe material) weldolets and threadolets

Tube Fittings - See Section 40 34 10 "STAINLESS STEEL TUBING"

2.3 FASTENERS

Bolts and nuts required for installation shall be in accordance with ASTM A 193, Grade B8M Class 2 and ASTM A 194 Grade 8M.

2.4 INSULATION

No pipe, tubing or components covered by this specification section require insulation.

2.5 COMPONENTS, PANELS AND OTHER EQUIPMENT

All other components, panels, and equipment shall be as shown on the drawings.

PART 3 EXECUTION

3.1 WORKMANSHIP

The Contractor shall demonstrate the satisfactory quality of representative tubing flares by means of tests under paragraph entitled "Quality Provisions" herein prior to any stainless steel tubing fabrication or installation.

Personnel whose workmanship is found to be unsatisfactory shall have their certification revoked and shall be requalified or removed from the project and replaced with qualified personnel at no additional cost to the Government.

All piping and tubing shall be installed as shown on the drawings. See Section 40 34 10 "STAINLESS STEEL TUBING" for tubing requirements. Where detailed dimensions are not given, the Contractor shall "field run" the lines in a neat and substantial manner. The Contractor shall reroute any field run lines contacting insulation on other piping or ductwork, pipe, tubing, equipment, steel work, etc. at no additional cost to the Government. No tubing shall be run in such a manner as to block access. Where any line conflicts with other work, resolution will be made by the Contracting Officer prior to routing of line(s).

Installation of tube runs and pipe in stacks shall require detailed planning and scheduling of same to utilize the automatic welding machine in the most productive fashion. The removal or loosening of installed tube or pipe to accommodate the automatic welding head shall be the Contractor's responsibility and shall be done at no additional cost to the Government.

3.2 STAINLESS STEEL TUBING

Tubing installation shall be in accordance with Section 40 34 10, "STAINLESS STEEL TUBING SYSTEMS".

3.3 PIPING SYSTEMS TESTING

Testing of stainless steel tubing shall be in accordance with Section 40 34 10, "STAINLESS STEEL TUBING".

3.3.1 Leak Test for Pneumatic Lines

The leak test shall be conducted after successful performance of the proof pressure tests, cleaning, and final adjustment of pipe supports has been accomplished. The test shall be at the maximum operating pressure for a minimum of 15 minutes with a maximum of 24 hours, unless otherwise specified. Each joint shall be tested with a leak detection solution conforming to MSFC-SPEC-384, Type I, with no visible leakage. The test may be terminated by direction of the Contracting Officer at any point during this period.

3.3.2 Test Records

Test records shall be prepared and maintained of all system tests. Records shall show Governmental and Contractor test personnel responsibilities, dates, test gage identification numbers, pressure ranges, rates of pressure drop, leakage rates, and other system characteristics. Test records shall be submitted to the Contracting

Officer for approval.

3.4 CLEANING

Refer to 40 34 10, "STAINLESS STEEL TUBING" for tubing cleaning.

3.5 Pressure Vessels and Pressurized Systems (PVS) Certification

Provide this certification as per submittal requirements.

3.6 TUBING SYSTEMS IDENTIFICATION

Tubing shall be identified in accordance with Section 40 34 10 "STAINLESS STEEL TUBING".

3.6.1 Metal Tags

Identification tags shall be installed on all components (valves, regulators, gages, etc.). The tags shall be 3 inches by 1 inch, stainless steel, and permanently marked with the assigned mechanical "A" number, electrical reference designator and matching drawing or control diagram designation. Tags shall be wired to component with No. 14 AWG (0.06408-inch-diameter) stainless steel wire and securely attached at top and bottom to prevent a swinging action.

3.6.2 Color Coding and Identification

All pipe and tubing shall be color coded. Color coding consists of titles, primary color warnings and flow direction arrows as described in KSC-STD-SF-0004B.

Titles shall be lettered on the two lower quarters of the tube or pipe or covering. Titles shall be visible from operating positions, especially those adjacent to control valves and panels. Titles shall be permanently fastened adhesive labels. Letters shall be upper case and numbers shall be arabic. Letter size shall be 1/2" for pipe diameters less than 1-1/2" and shall be 3/4" for tube and pipe diameters greater than 1-1/2".

Primary color warnings shall consist of 1" wide bands which completely encircle the pipe. Bands shall be painted on and shall be applied no less than 40' apart on straight runs. Immediately adjacent to and upstream of all operating accessories such as valves, regulators and flow checks, all coded systems shall be painted on and all coded systems shall be painted with primary color. In addition, primary color warnings shall be painted throughout the system at convenient intervals (e.g. at branch lines, penetrations, and other conspicuous places).

Secondary color warning arrows are used to identify the directions of flow within the pipe and appear adjacent to the color warning bands. Arrows shall be dimensioned per KSC-STD-SF-0004B, Figure 2-1.

Primary and Secondary warning colors are based on the medium in the pipe or tube system and are identified below:

MEDIUM	PRIMARY WARNING (BAND COLOR)	SECONDARY WARNING (ARROW COLOR)
Nitrogen	Gray	Black

Those sections of piping that are concealed by inclusion in walls or partitions are not subject to these requirements.

Each panel-mounted component shall be identified on the face of the panel by a plate mounted adjacent to the component (beneath the component if practicable).

The legend on the plate shall provide clear, concise and positive component identification, including the component's name, find number, medium, and pressure. The plate shall be 1/8-inch thick (nominal) laminated phenolic surface. The plate shall be rectangular in shape, with beveled edges, and shall be securely mounted to the panel with a suitable adhesive. Each complete panel containing components (valves, gages, bulkhead connection points, etc.) shall be identified on its face by a plate which clearly defines the purpose of the panel (3/16-inch letter size).

3.7 QUALITY PROVISIONS

3.7.1 Inspection Requirements

The Contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the Contractor may utilize his own or any other inspection facilities and services acceptable to the Government. Inspection and test records shall be kept complete and provided to the Contracting Officer or his designated representative. The Contracting Officer, or his designated representative, reserves the right to perform (at Government expense and without any increase in contract price) any or all of the inspections set forth in this specification to ensure that the end item conforms to the prescribed requirements.

-- End of Section --